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## Predictors of Cognitive Reactivity in Depression

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A thesis submitted in partial fulfillment of the requirements for the Master of Science degree in Psychology

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## Abstract

Cognitive theories of depression posit that, when activated by an external stressor, negative self-schemas negatively bias information processing. The congruency hypothesis suggests that higher overlap between schema and stressor content results in greater degrees of schema activation. To evaluate these theoretical premises, the current study evaluated whether: 1) cognitive organization is predictive of negative information processing biases following a negative mood prime; and, 2) content domain of cognitive organization interacts with content of mood prime to predict information processing biases. Undergraduate students ( $N = 157$ ) completed a measure of cognitive organization, underwent a negative mood prime, and completed a measure of interpretation biases. Consistent with hypotheses, cognitive organization in the negative achievement and interpersonal positive domains was predictive of information processing biases. Contrary to predictions, no interaction effects were found. Findings support the notion that cognitive organization is an important vulnerability factor in depression. Limitations and future directions are discussed.

*Keywords:* depression; cognitive schemas; cognitive organization; congruency; interpretation biases

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## Predictors of Cognitive Reactivity in Depression

Major Depressive Disorder is a debilitating disorder that affects approximately 12% of adults over the course of a lifetime (Langlois, Samokhvalov, Rehm, Spence, & Goyer, 2012). Symptoms of depression include feelings of sadness, hopelessness, guilt, worthlessness, and a diminished sense of pleasure (American Psychiatric Association [APA], 2013). According to the Canadian Community Health Survey, approximately 3.2 million Canadians experience symptoms consistent with a Major Depressive Episode during their lifetime (Pearson, Janz, & Ali, 2013). These episodes last an average of 6 months (Rhebergen et al., 2010), and are often recurrent: approximately 50% of individuals who recover from their first depressive episode have an additional episode over the lifespan (APA, 2000; Kupfer, Frank, & Wamhoff, 1996). With each depressive episode, an individual's chance of enduring an additional episode increases by approximately 15% (Seemuller et al., 2010). Given these discouraging numbers, it comes as little surprise that assessments of disease burden rank major depression as the second leading cause of years lived with a disability (Ferrari et al., 2013). Beyond the burden to the individual, depression poses a significant economic strain. Estimates suggest that improving the treatment of depression for unemployed Canadians has the potential to boost the Canadian economy by upwards of \$32.2 billion per year (Southerland & Stonebridge, 2016).

Given this need, a number of empirically supported treatments— including both pharmacotherapy and psychotherapy— have been developed for the treatment of major depression (see Nathan & Gorman, 2015 for review). Despite the success of these treatments, systematic reviews of numerous blinded trials demonstrate that, on average,



approximately half of depressive symptoms remain following active treatment (e.g., Khan, Faucett, Lichtenberg, Kirsch, & Brown, 2012). Moreover, there appears to have been little, if any, improvement in the prevalence of major depressive episodes or in the associated degree of distress over the past decade (Patten et al., 2016). For these reasons, continued research efforts targeted at understanding the mechanisms that contribute to the onset and maintenance of depression are of pressing importance.

### **Conceptual Overview and Research Objectives**

The following section provides a brief framework of the theoretical and empirical foundations for the current study, after which a more detailed description is presented. Of the various etiological theories of depression, significant attention has been given to the role of cognitive factors in the onset and maintenance of the disorder. Cognitive theories of depression follow a ‘diathesis-stress’ model whereby negative self-schemas are viewed as latent vulnerability factors for the disorder (Beck, Rush, Shaw, & Emery, 1979). When activated by a stressor, schemas are thought to negatively alter cognitive content (i.e., thoughts) and processing (i.e., attention, memory, interpretation). A refinement of this model (the *congruency hypothesis*) suggests that schemas are maximally activated when the content of the schema and stressor overlap (Beck, 1983). Beyond its content, the structure of the schema, or one’s *cognitive organization*, is thought to influence how readily schemas are activated, and thus the degree to which they negatively influence cognition and mood (Beck & Dozois, 2011, 2014; Dozois & Beck, 2008).

Consistent with the diathesis stress model, laboratory studies testing cognitive theories of depression frequently employ Mood Induction Procedures (MIPs), as the induction of a negative mood state is thought to mimic the effects of a naturalistic

stressor on the schema (Persons & Miranda, 1992). Research employing MIPs suggests that individuals with past depression or those at risk for depression demonstrate greater increases in negative patterns of thinking following a negative mood induction procedure, compared to healthy controls (e.g., Ingram & Ritter, 2000; Gilboa & Gotlib, 1997; Hedlund & Rude, 1995). These differences in susceptibility to negative thinking suggest the presence of an underlying negative cognitive vulnerability in the at-risk groups, that is absent in healthy controls; such underlying cognitive vulnerability might account for the differences in negative thinking patterns observed. Although empirical data have yet to test this hypothesis, it is possible that cognitive organization represents such vulnerability. Evaluating this possibility in a non-depressed sample allows one to determine whether cognitive organization serves as a depressive risk factor that is present prior to the onset of a depressive episode, rather than a correlate of current depression or scar of previous depression.

The aim of this project was twofold: first, this study tested the traditional diathesis-stress model of depression, attempting to validate schema structure as a cognitive vulnerability (diathesis) that, when activated by a stressor (negative MIP), results in changes in information processing. Second, this study examined the congruency hypothesis by assessing the specificity of cognitive organization content and its relation to information processing biases following schema-congruent or incongruent primes. The following sections provide a review of the cognitive theory of depression, including a discussion of both schema content (as it relates to the congruency hypothesis) and schema structure. After reviewing the theoretical premise behind priming procedures and

pertinent empirical findings, the rationale for the current study and associated hypotheses are presented.

### **The Cognitive Perspective**

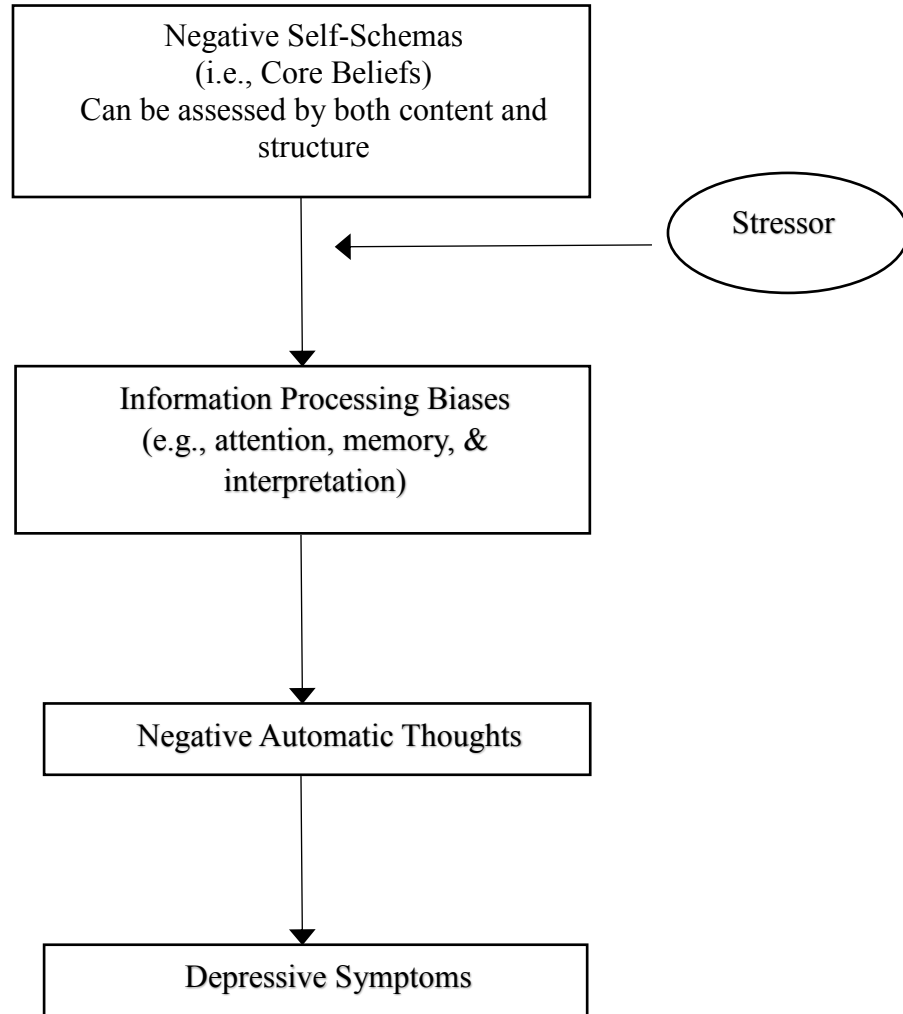
An abundance of research has examined cognitive risk factors for depression. Much of this work has been based on Beck's cognitive model of depression (Beck, 1963; Beck et al., 1979). A fundamental assumption of this model is that events and experiences one endures do not themselves cause depression; rather, it is the interpretation of such experiences that dictates one's emotional and behavioural responses. As mentioned above, Beck's theory follows a 'diathesis-stress' model, whereby underlying vulnerabilities give rise to depression when triggered by a stressor (Wills, 2009). Central to Beck's conceptualization is the notion of negative self-schemas, described as enduring cognitive structures arising from early experiences that contain core beliefs about the self. Core beliefs are thought to be the most fundamental level of cognition, in that they are global, rigid and overgeneralized (Beck, 2011). For example, depressogenic core beliefs might include statements such as, "I am defective"; "I am incompetent"; or "I am unlovable."

Negative self-schemas are thought to lie dormant until they are activated by a stressor that in some way resembles the conditions under which the schema originally developed (Beck et al., 1979). Once activated, negative self-schemas and the associated core beliefs are thought to filter one's experiences in ways that align with pre-existing negative views about the self. That is, activated schemas negatively bias how information in one's environment is attended to, interpreted, and subsequently recalled (collectively termed, *information processing biases*, the second level of cognition). These negative

biases serve to reinforce the core beliefs held within the schema. For example, an individual with an activated schema containing the negative core belief that he or she is unlovable is likely to attend to, recall, and interpret ambiguous information in a manner which re-affirms this core belief, while disregarding evidence to the contrary.

Negative biases in information processing are then thought to result in a third level of cognition, termed *negative automatic thoughts*. Automatic thoughts refer to the actual words or images that cross one's mind on a day-to-day basis, and are typically believed to represent the most superficial level of cognition (Beck, 2011). Beck et al. (1979) argued that the negative automatic thoughts of depressed individuals often center around three major themes: that of themselves, their world, and their future. The behavioural and emotional sequelae of depression are thought to arise from these negative patterns in cognition. Thus, schemas result in negative information processing biases, which subsequently affect negative automatic thoughts (See Figure 1). These processing biases represent 'cognitive shortcuts' to thoughts assumed to be true, regardless of whether such views are accurate (Rafaeli, Bernstein, & Young, 2011).

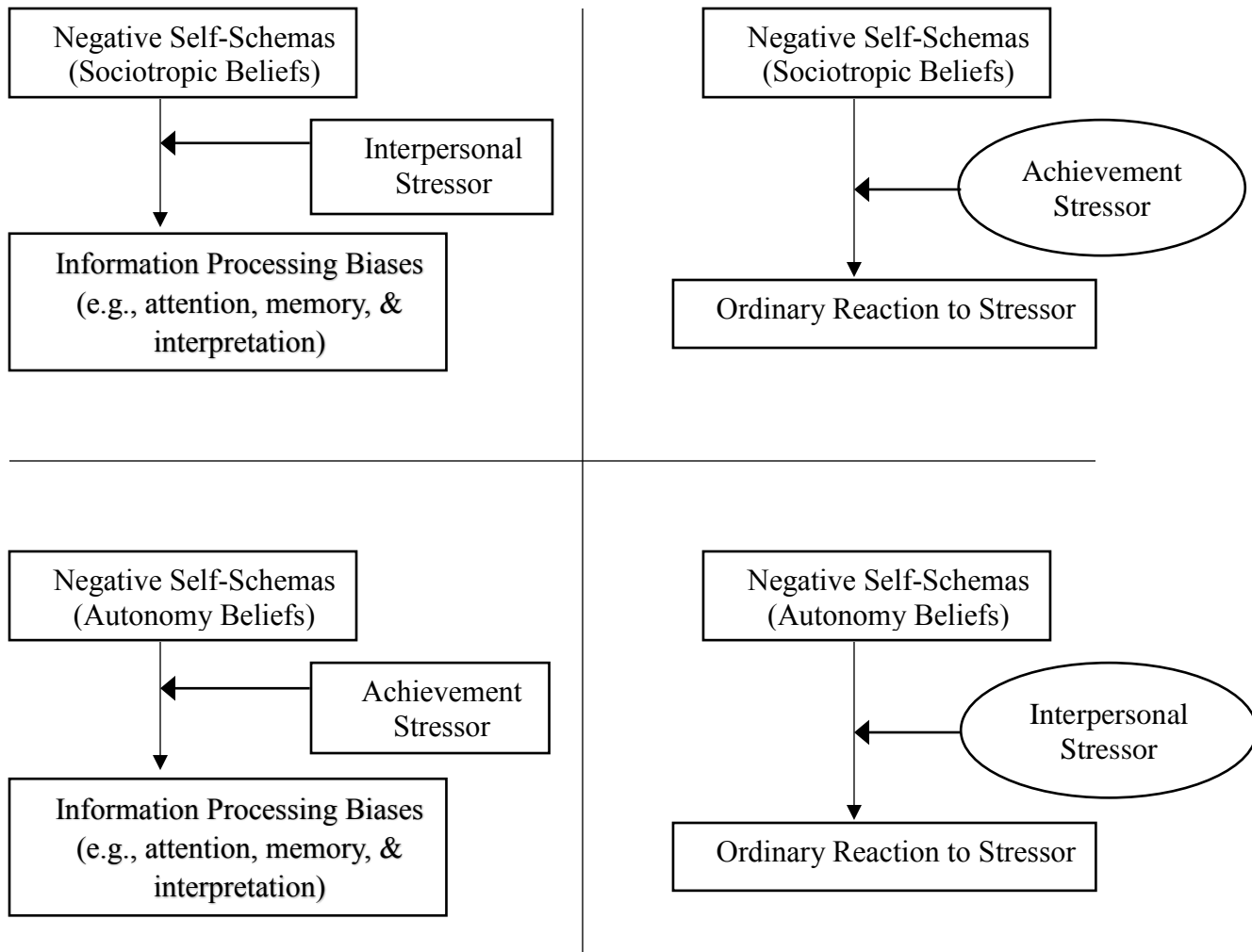
**Schema content, and the congruency hypothesis.** In an extension of his original theory, Beck (1983) described two types of individuals who hold distinct concepts (*content*) within their schemas, rendering them vulnerable to depression when they experience a relevant life stressor. Similar discussions of these two distinct personality types have been articulated by various authors (e.g., Arieti & Bemporad, 1980; Blatt, 1974; Bowlby, 1977; see Robins, Hayes, Block, Kramer, & Villena, 1995), and, despite some unique features of each conceptualization (Robins, 1994), there is significant overlap in the hypotheses they offer (Robins et al., 1995). The first personality type,



*Figure 1.* Overview of Beck's Cognitive Model of Depression (adapted from Dozois & Beck, 2008).

termed *sociotropy* or *dependency*, refers to individuals who overemphasize their acceptance and approval by others when defining their self-worth. These individuals, have a strong desire to be close to, loved, supported and understood by others, and often rely on reassurance in their close relationships to provide them with a sense of well-being (Beck, 1983; Beck, Epstein, Harrison, & Emery, 1983; Blatt, 1974; Zuroff, Quinlan, & Blatt, 1990). Conversely, *autonomous* or *self-critical* individuals are thought to place greater emphasis on their achievement of personal goals, independence, self-definition, and control when defining their self-worth. These individuals rely on their personal achievements to provide them with a sense of well-being, and often have stringent criteria for their own success.

According to the congruency hypothesis, depressive symptoms develop when individuals are met with stressors that match their domain of vulnerability. Under this view, negative life events relating to interpersonal content such as rejection, disapproval, abandonment, separation, and loss are particularly potent for activating underlying beliefs of being unlovable and unwanted in sociotropic individuals. Alternatively, negative life events relating to failure, threats to independence, or doing poorly compared to others are particularly influential for autonomous individuals; these events are thought to activate self-blame and beliefs regarding helplessness and incompetence. The congruency hypothesis states that sociotropic and autonomous individuals should be maximally vulnerable to depression when they encounter the types of stressor that ‘match’ their personal vulnerabilities (Beck, 1983; see Figure 2).



*Figure 2.* Visual summary of the Congruency Hypothesis. In the top left panel the interpersonal stressor is congruent with the sociotropic core beliefs held within the self-schema; this congruency results in negative information processing biases. In the top right panel, the achievement stressor is incongruent with the sociotropic core beliefs held within the schema; this incongruence results in a typical reaction to the stressor. A similar depiction of the theory as it pertains to autonomy core beliefs is presented in the lower panels.

Numerous attempts have been made to evaluate the empirical status of the congruency hypothesis (see Appendix A for summary table). This research has varied immensely with respect to the types of stress and depression assessments utilized (e.g., self-report, interview-based), study design (e.g., retrospective, prospective, cross-sectional), personality measures used (e.g., Sociotropy-Autonomy Scales [SAS]; Depressive Experiences Questionnaire [DEQ]), and operationalization of depression (e.g., relapse, onset, diagnosis, symptoms; Francis-Raniere, Alloy, & Abramson, 2006). Although considerable heterogeneity exists in the methodology adopted, several trends are noteworthy within this literature. The research with respect to the congruency hypothesis has been mixed overall, but more consistent empirical support has generally been found for sociotropy than for autonomy (Clark, Beck, & Alford, 1999; Coyne & Whiffen, 1995; see Appendix A). More favorable findings are typically derived from methodologically stronger studies that employ prospective designs and utilize semi-structured interviews in their assessment of stress and depression (Francis-Raniere et al., 2006). While these studies have generally found that sociotropy moderates the impact of negative interpersonal events on depression, specificity to negative social events has yet to be demonstrated (Frewen & Dozois, 2006).

Additional trends in the congruency literature can be used to inform the current investigation. First, the majority of studies have examined the impact of congruency on depressive symptoms directly rather than on negative cognition (see Appendix A). Examining congruency as it relates to theoretical precursors to depressive symptoms (e.g., negative information processing) allows one to better examine how congruency operates in the context of Beck's cognitive model for depression. Second, most studies



have examined congruency using naturalistic stressors (e.g., life events checklists/interviews), in which stressors are categorized by the researcher as primarily interpersonal- or achievement-oriented (see Appendix A). Despite the regimented nature of this approach, one limitation is that investigator classification fails to account for the idiosyncratic meaning that one may attribute to a stressor. For example, although traditional classification schemes categorize events such as failing a test as primarily achievement-oriented (e.g., Bartelstone & Trull, 1995), it is plausible that they bear more interpersonal consequences (e.g., embarrassment of failing; disapproval from others) than achievement consequences for a given individual. This possibility highlights the potential utility in using paradigms in which participants classify stressors, therefore accounting for the individual meaning that he or she ascribes to the event. Finally, errors in the measurement of personality constructs may contribute, at least partially, to the wide array of congruency findings. For example, studies that have used the autonomy scale of the SAS have often failed to support the predictions made by congruency (e.g., Robins et al., 1995). Accordingly, others have suggested that the SAS Autonomy scale may not be measuring constructs related to depressive vulnerability (Blaney & Kutcher, 1991; Robins & Block, 1988; Robins, Block, & Peselow, 1989). These confounds call for an examination of congruency using new methods to assess vulnerability in the sociotropy and autonomy domains; one lucrative alternative may be assessing vulnerability by means of one's schema structure.

**Beyond Content: The Role of Schema Structure.** In addition to its content (i.e., negative beliefs and assumptions) the structure of the schema is also theorized to influence one's vulnerability to depression (Beck, 1967). Schema-structure, or cognitive

organization, refers to the degree of interrelatedness of the elements (e.g., memories, concepts, beliefs, facts; Bower, 1981; Ingram & Hollon, 1986) about self that are contained within the schema (Dozois & Beck, 2008). Conceptually, one can imagine these elements as represented by nodes within a larger interconnected network (Bower, 1981). The degree of interrelatedness of such nodes bears on one's risk for depression in several ways. First, if negative nodes (i.e., negative beliefs, memories, facts about self) are more interconnected (i.e., are 'closer' to each other in the network), then activation of one node should theoretically spread more rapidly across the network, subsequently activating neighboring nodes (Anderson, 1983; Collins & Loftus, 1975; Higgins & Bargh, 1987; Rogers, 1981). Clinically, this could present as more rapid recall of several negative beliefs and memories about the self, following initial activation of just one negative node by an external event (Auerbach, 1985; Dunn, 1985; Siomopoulos, 1983). In a related sense, the more interconnected negative nodes one has in his or her schema, the wider the array of stimuli that could activate the schema (Ingram et al., 1998). As schemas become more readily activated, they are thought have a greater negative influence on information processing (e.g., attention, interpretation, and recall; Clark et al., 1999). In sum, more tightly interconnected negative schemas are thought to be easier to activate, thus having a greater effect on cognitions and emotions (Bower, 1981), rendering one more susceptible to depression.

While research efforts have traditionally focused more on the content of schemas when considering risk for depression (Dozois & Dobson, 2001a), there is good reason to redirect attention to the role of cognitive organization. Empirical findings demonstrate that cognitive organization has unique utility to predict depressive symptoms over and

above schema content (e.g., Lumley, Dozois, Hennig, & Marsh, 2012). These findings suggest that cognitive organization is a distinct and clinically useful construct.

Additionally, increasing evidence suggests that cognitive organization meets several criteria required to be considered a vulnerability factor for depression (Dozois & Rnic, 2015). For example, cognitive organization appears to be sensitive to depression:

previous research has shown that negative self-referent information is more tightly interconnected and positive self-referent information less interconnected in individuals with clinical depression (Dozois & Dobson, 2001a), severe dysphoria (Dozois, 2002; Dozois, Eichstedt, Collins, Phoenix & Harris, 2012; Lumley et al., 2012), and in those with previous depression (Dozois & Dobson, 2003), than nonpsychiatric controls.

Furthermore, negative schema content has been shown to be more tightly interconnected, and positive content more diffusely interconnected, in individuals with a greater number of previous depressive episodes when compared to those with fewer episodes (Dozois & Dobson, 2003). In addition, certain aspects of cognitive organization appear unique to depression, when contrasted with the self-representation of individuals with anxiety (Dozois & Dobson, 2001b; Dozois & Frewen, 2006; Lumley et al., 2012). These findings support the notion that cognitive organization may also be a vulnerability factor that is specific to depression.

Beyond sensitivity and specificity, vulnerability factors are conceptualized to be trait-like factors, rather than transient constructs present only during depressive episodes (Ingram, Miranda, and Segal, 2006). In line with this requirement, negative cognitive organization – particularly in the interpersonal domain – appears to persist beyond a current depressive episode (Dozois, 2007; Dozois & Dobson, 2001b). This stability

appears to be unique to cognitive organization, as it is not found in other layers of depressotypic cognition (e.g., information processing biases and negative automatic thoughts; Dozois, 2007; Dozois & Dobson, 2001b). Further, vulnerabilities are thought to be constructs that lie dormant until they are activated in some manner (Ingram et al., 2006). Although not directly evaluative of this proposal, but consistent with it and the diathesis-stress model of depression, cognition organization of negative content has been shown to mediate the relations between early parental emotional maltreatment and depressive symptoms, and physical abuse and depressive symptoms (Lumley & Harkness, 2009). While these findings were attained cross-sectionally, further work has found that aspects of cognitive organization interact with negative life events in longitudinal predictions of depressive symptoms, even after controlling for initial depression (Seeds & Dozois, 2010). Collectively these findings support the notion that cognitive organization may be ‘activated’ by an external stressor to influence subsequent depressive symptoms. Given this empirical literature on the sensitivity, specificity, stability, and required activation, it is apparent that there is increasing support for the role of cognitive organization as a vulnerability factor in depression. Thus, further investigation of how this construct operates in the context of Beck’s cognitive model and the congruency hypothesis, is warranted<sup>1</sup>

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<sup>1</sup> Cognitive organization has previously been examined indirectly through a variety of additional methods, including the Prime-Target Relatedness (Segal & Gemar, 1997), Self-Complexities (Linville, 1985), Attribute Redundancy (Dozois & Dobson, 2001a), Self-Referent Encoding Tasks (Derry & Kuiper, 1981), and Self-Compartmentalization (Jordon & Cole, 1996; Showers, 1992) etc., each with their own strengths and limitations. However, a thorough review of these methods and their associated findings is beyond the scope of this paper.

## **Negative Mood Induction Procedures: The Need for a Prime to Assess Information Processing**

Beck's cognitive theory sparked initial attempts to validate his notion that individuals at risk for depression possess underlying core beliefs (i.e., content) within their schemas, which result in increases in negative thinking patterns. Contrary to predictions, initial studies provided very little support for this theory, as individuals both at-risk for depression (i.e., remitted samples) and healthy controls were found to demonstrate similar levels of negative cognition (Ingram et al., 1998); such a pattern would not be anticipated if the at-risk individuals possessed stable negative schema content. These findings were problematic for traditional cognitive theory, and they initiated speculation that cognitive features were simply correlates or consequences of depression, rather than precursors (Haaga, Dyck, & Ernst, 1991; Scher, Ingram, & Segal, 2005).

Despite these speculations, Ingram et al. (1998) stress that these studies did not employ strategies to activate the cognitive content of the schema, and thus failed to account for the 'stressor' in the diathesis-stress model. As such, it is possible that differences in negative cognition were not seen between the at-risk and control groups, because the underlying vulnerability (i.e., schema content) remained "dormant." Consequently, research in this field has increasingly utilized negative MIPs to activate or prime the content of depressotypic schemas.

Although a variety of negative MIPs/priming procedures exist (see Martin, 1990, for review), research in depression commonly induces a sad mood in the lab by asking participants to listen to sad music while reflecting on a negative time or event in their life.

The induction of a sad mood through such methods is thought to mimic the effects of an environmental stressor on the schema, serving to ‘activate’ a latent depressogenic schema in the same way a naturalistic stressor would. These approaches largely rely on Bower’s (1981) theoretical premise that individuals hold networks of interconnected mood and memory nodes; activation of one node can spread throughout the network, such that changes in one type of node can yield changes in the other. Echoing a similar theme, the *mood congruency hypothesis* (Persons & Miranda, 1992) suggests that cognitive content and processes are stable vulnerability factors, but only accessible during negative mood states. That is, in the absence of negative mood to activate underlying beliefs, these negative cognitive patterns are only present in their “latent” form, and therefore inaccessible.

**Empirical Findings Using an MIP.** Studies that utilized negative MIPs provided a fresh and favourable perspective for cognitive theories of depression. Results from these studies showed that previously depressed individuals are more susceptible to increases in measures of negative schema content (i.e., thoughts) following a negative MIP, compared to never-depressed individuals (Gemar, Segal, Sagrati, & Kennedy, 2001; Lau, Haigh, Christensen, Segal, & Taube-Schiff, 2012; Miranda, Gross, Persons, & Hahn, 1998; Miranda & Persons, 1988). Similar results were found when using naturally occurring affect (Roberts & Kassel, 1996), diurnal mood variations (Miranda, Persons, & Byers, 1990), and other measures of schema content (e.g., irrational beliefs, Solomon, Haaga, Brody, Kirk, & Friedman, 1998; ratings of the self-descriptiveness of words, Timbremont & Braet, 2004). These results suggest that in a negative mood state, negative

schema content is detectable in individuals who are theoretically at risk for depression (e.g., a remitted sample), but not in healthy controls.

Similar results are found when examining information processing: previous studies have found negative attention biases in primed remitted samples that are not evident in healthy controls (e.g., Ingram, Bernet & McLaughlin, 1994; Ingram & Ritter, 2000; McCabe, Gotlib, & Martin, 2000). Studies examining negative memory biases show parallel findings (e.g., Gilboa & Gotlib, 1997, Teasdale & Dent, 1987; Timbremont & Braet, 2004). Further, evidence for negative interpretation biases in primed remitted samples but absent in never-depressed individuals has also been found (Hartlage, 1990; Hedlund & Rude, 1995; Gemar et al., 2001; LeMoult, Joormann, Sherdell, Wright & Gotlib, 2009). These results demonstrate that at-risk individuals are more susceptible to negative thoughts and information processing when primed by a negative mood state. Such findings align with Beck's contention that individuals at risk for depression possess a stable vulnerability factor (i.e., schema), that when activated by a stressor (or prime), results in negative information processing.

Additional evidence suggests that negative cognitive processing is present in at risk populations *prior* to the development of depression (in children of depressed mothers; e.g., Dearing & Gotlib 2009; Joormann, Gilbert, & Gotlib, 2010; Joorman, Talbot & Gotlib, 2007). These findings refute the possibility that negative cognitive processing patterns are simply a 'scar' from previous depression, but rather, occur prior to the onset of depression due to pre-existing cognitive vulnerability. However, the best way to capture or understand such underlying cognitive vulnerability remains an empirical question.

Investigating whether cognitive organization represents such cognitive vulnerability makes conceptual sense for two reasons. First, as discussed above, aspects of cognitive organization may represent a stable vulnerability marker for depression (Dozois, 2007). That is, aspects of cognitive organization may remain present, even outside of a current depressive episode. The presence of stable negative cognitive organization in at-risk individuals, that is absent in healthy controls, may explain why individuals at-risk demonstrate negative thinking patterns when primed –even when not currently depressed –whereas those without risk do not. Second, as mentioned, Bower (1981) contended that activation in a semantic network can spread across mood and memory nodes. Following this notion of spreading activation, one would expect that individuals with more tightly interconnected negative nodes experience enhanced spreading of activation across such nodes. Theoretically, this enhanced activation makes negative information more readily available and accessible, therefore having a greater influence on information processing. Conversely, if positive information was more diffusely interconnected, one would anticipate reduced spreading activation, and thus, a reduced influence of positive information on information processing. The use of cognitive organization as a predictor variable will afford the opportunity to test this theory.

***Congruency and Mood Priming.*** Further work has applied priming procedures to better evaluate Beck's congruency hypothesis - that schemas are optimally activated when stressor and schema content match. Zuroff and Mongrain (1987) classified female college students as 'dependent' or 'self-critical' (analogous to sociotropic and autonomous, respectively) based on their responses on the Depressive Experiences



Questionnaire (Blatt, Quinlan, Chevron, McDonald, & Zuroff, 1982). Students were then primed with audio-recordings describing a break-up (rejection prime) and failure in an academic setting (achievement prime), and completed measures of dependent and self-critical state depression. Results were mixed, in that dependent students' ratings of dependent depression were specific to the rejection prime, but self-critical students reported self-critical depression following both rejection and achievement primes. In a similar paradigm, Allen, Horne, & Trinder (1996) found that sociotropic individuals were vulnerable to dysphoric mood states following a social rejection prime, and to a lesser degree an achievement prime. Contrary to expectations, autonomy did not appear to be a vulnerability factor for either type of prime. Finally, while Dozois and Backs-Dermott (2000) showed support for the congruency hypothesis in the information-processing patterns of sociotropic individuals, a parallel investigation of autonomous individuals is still required. Thus, it is presently unclear whether cognitive vulnerabilities and subsequent negative information processing are maximally evoked when stressors and schema content match.

### **Investigating interpretive biases**

While the reviewed literature encompasses multiple forms of information processing (attention, memory, and interpretation biases) a focus on the latter is warranted for several empirical and theoretical reasons. Most elementary, one notes the comparatively smaller body of literature on the causal role that interpretive biases play in the onset of depression, when compared to other forms of information processing (Scher, et al., 2005). This discrepancy allows for the current investigation to provide a valuable contribution to the literature. Further evidence suggests that other forms of information

processing may be most relevant to anxiety, whereas interpretive biases are more strongly associated with depression (Dozois & Beck, 2008), making it the most appropriate focus for the present investigation on theories of depression.

From a theoretical perspective, interpretation biases are often viewed as the most surface-level or accessible forms of information processing (Clark et al., 1999). Conceptually, this view makes sense when one considers how interpretive biases affect one's moment-by-moment actions. That is, it is interpretation biases that dictate how individuals behave 'in real time' as they go throughout their day (e.g., if one interprets someone's benign comment negatively, he or she might then become avoidant or disengaged). In this way, interpretive biases and their behavioural consequences are most readily 'accessible' when compared to other forms of information processing. In a related fashion, interpretive biases are the most targeted form of information processing biases in empirically supported treatments for depression, including cognitive behavioural therapy (CBT; e.g., Power, 2013). A large focus of CBT for depression involves *cognitive restructuring*, or teaching clients skills for challenging negative interpretations of people, events, and situations. Similarly, treatment approaches such as *Cognitive Bias Modification Training* also rely on the premise that altering negative interpretations of benign scenarios will result in positive improvements in clients' symptoms (e.g., Mathews & Mackintosh, 2000; Micco, Henin, & Hirshfeld-Becker, 2014). Thus, given the attention that interpretive biases receive in treatment, it makes sense to further examine whether such biases operate as one would theoretically anticipate.

## **The Present Study**

The current state of the literature yields two conclusions that lend themselves to important empirical questions. To begin, the studies reviewed demonstrate that when primed, individuals at risk for depression demonstrate negative cognitive patterns not found in those without risk. Despite these findings, it remains unclear why individuals at risk are more readily primed by negative MIPs than are healthy controls, despite the absence of current depressive symptoms in both parties. Cognitive theory would predict that the presence of stable negative self-schemas in those individuals at risk, and the absence of such schemas in healthy controls, account for these differences. Beyond the content of the schema, the organization of the schema may be important for accounting for these differences, given the evidence supporting its role as a vulnerability factor, and its theoretical relation to spreading activation, and influence on accessibility of negative and positive content. Therefore, the first objective of this study was to test the traditional diathesis-stress model of depression, attempting to validate cognitive organization as a cognitive vulnerability factor (diathesis) that, when activated by a stressor (negative MIP), results in biases in interpretation.

In addition, the current literature is equivocal with respect to the congruency hypothesis, and has yet to look at congruency as it pertains to cognitive structure. Accordingly, this study tested the congruency hypothesis in the context of cognitive organization. That is, this study examined whether cognitive organization in both the interpersonal and achievement domains interact with the content of a mood prime (either achievement or interpersonal) to influence patterns in information processing.

**Hypotheses.** With respect to the first objective, individuals with more tightly interconnected negative self-referent representations and/or poorly interconnected positive self-referent representations were expected to show greater negative processing biases following a negative mood prime than those with diffusely connected negative and/or tightly connected positive self-schemas. This hypothesis was expected to hold true across all domains of cognitive organization (interpersonal positive, interpersonal negative, achievement positive, achievement negative).

With respect to the second objective, a Prime  $\times$  Cognitive Organization interaction was predicted, such that the negative processing biases were expected to occur when the domain of the prime (interpersonal versus achievement) was congruent with the domain of cognitive organization (interpersonal or achievement) that shows a negative structure.<sup>2</sup>

## **Method**

### **Participants**

First year undergraduate students at Western University were recruited through the psychology research participation pool (SONA) and received course credit as compensation. Individuals who previously completed a similar study in the lab were ineligible for the present study, due to the significant overlap in measures used. Additionally, proficiency in the English language (assessed via self-report) was required for inclusion, as many of the study tasks involved the comprehension of English words. Eleven participants were excluded from the study on the basis of experimenter recorded

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<sup>2</sup> Negative schema structure refers to that which shows greater degrees of interconnectivity among negative self-referent content, and poorer connectivity among positive self-referent content.

behavioural indices indicating that participants did not engage in the task or sufficiently understand the English language. The final sample included 157 participants (109 female; 47 male; 1 transgendered). Participants ranged in age from 17-26 years ( $M = 18.31$ ,  $SD = 1.21$ ) and years of completed education ranged from 12-15 years ( $M = 12.20$ ,  $SD = 0.54$ ). Of this sample, 42.4% identified as Caucasian, 18.0% Chinese, 16.2% South Asian, 8.4% were of mixed ethnicity (two or more ethnicities specified) and 9.0% self-identified as Other. A small percentage (12.0%) of participants reported previous therapy or counseling for an emotional/psychological problem in the past or present, and 7.8% reported taking medication for an emotional/psychological problem in the past or present.

### **Measures**

**Demographics.** A basic demographics questionnaire (see Appendix B) was administered to participants to assess various demographic (age, gender, ethnicity, education) and clinical (history of previous mental illness, previous psychological or psychiatric treatment) characteristics. This questionnaire was developed by the researchers for the present study.

**Depression Severity.** The Beck Depression Inventory II (BDI-II; Beck, Steer, & Brown, 1996) was used to measure self-reported depressive symptomology. The BDI-II is a 21-item questionnaire that asks participants to rate the perceived intensity of each symptom over the past two weeks, on a 4-point scale ranging in value from 0-3 (increasing in severity). Items are organized into various domains including “Sadness”, “Pessimism”, and “Loss of Pleasure.” A total score is calculated by summing across the items, with higher scores indicating greater severity of depression. This measure has shown strong psychometric properties including high convergent validity when correlated

with similar measures (e.g., Hamilton Psychiatric Rating Scale for Depression,  $r = .71$ ; Beck et al., 1996), and high test-retest reliability ( $r = .93$ ; Dozois & Dobson, 2001a). The internal consistency (Cronbach's alpha) for the current study sample was .88.

**Cognitive Organization.** The Psychological Distance Scaling Task (PDST; Dozois & Dobson, 2001a, 2001b) was used to evaluate schema-structure pertaining to both the interpersonal and achievement domains. Participants were presented with a square grid ( $10 \times 10$  cm) on the computer monitor, divided into four quadrants. The x-axis was anchored with the statements not at all like me on the leftmost side and very much like me on the rightmost side, referring to the self-descriptiveness of the adjective. The y-axis referred to the valence of the word and was anchored with the statements negative on the bottom of the grid and positive on the top of the grid. Individual adjectives were presented in a randomized order in the center of the screen, and participants were instructed to indicate the point on the grid (using the computer mouse) that accurately described their self-descriptiveness and valence of the target adjective. Following each response, a new grid and new adjective were presented. Initially, to ensure familiarity with the task, participants completed 4 practice trials. The experimental trials were comprised of 20 adjectives from each domain of interest: achievement positive (e.g., successful), achievement negative (e.g., incompetent), interpersonal positive (e.g., trustworthy), and interpersonal negative (e.g., rejected). The adjective list (see Appendix C) had previously been matched for emotional intensity, imaginability, word length, and word frequency, and has demonstrated excellent inter-rater reliability for the content domain of each adjective (94% agreement;  $\kappa = .87$ ; Dozois, 2007; Dozois & Frewen, 2006).

The computer recorded the x/y coordinate point for each adjective to calculate the average interstimulus distances among positive and negative target words. Interstimulus distance was calculated using the following formula:

$$\sqrt{\frac{\sum (X_1 - X_2)^2 + (X_1 - X_3)^2 + \dots + (X_{19} - X_{20})^2 + (Y_1 - Y_2)^2 + (Y_1 - Y_3)^2 + \dots + (Y_{19} - Y_{20})^2}{n(n-1)/2}}$$

where X indicates adjective placement on the self-descriptiveness axis, Y indicates adjective placement on the valence axis, and n is the total number of self-descriptive adjectives. Therefore, the interstimulus distance scores reflects the sum of squared distances for each adjective content, controlling for the total number of possible distances for that content (see Dozois & Dobson, 2001a, for further information). This task is based on the assumption that schema interconnectedness is reflected in the way individuals organize self-relevant information, such that greater distance among adjectives indicates less interconnectedness of the schema and vice versa (Bower, 1981; Ingram et al., 1998). Interstimulus distance scores were calculated for each of the four domains of interest, described above. The PDST has been used in several previous studies examining cognitive organization (Dozois 2007; Dozois & Dobson 2001a; Dozois & Frewen, 2006) and has demonstrated strong psychometric properties (Dozois, 2002; Dozois & Dobson, 2001a).

**Mood State.** A Visual Analogue Scale (VAS) was used to assess participants' current mood state (see Appendix D). Participants were presented with a 10 cm horizontal line that was anchored with the statements sad on the leftmost side and happy on the rightmost side (Segal, Gemar, & Williams, 1999). Participants were instructed to

click and place an “X” on the line corresponding to their current mood state. This mood assessment method has been used in various previous studies using negative MIPs (e.g., Segal et al., 1999). Scores were calculated by setting the far left end of the line as zero and measuring the distance from that point. Mood change following the negative MIP was calculated by subtracting the second mood rating (after mood induction) from the first mood rating (before mood induction).

**Negative Mood Prime.** A negative mood induction procedure (MIP) was utilized to mimic an environmental stressor in order to activate individuals’ negative self-schemas. Participants were randomly assigned to receive either an achievement-related or an interpersonal-related prime. Individuals were instructed to recall a time in their lives when they felt sad “due to failing to achieve a desired achievement-related goal” (e.g., poor exam performance, failed job performance, poor evaluation) or “due to a negative experience in a relationship with a close other” (e.g., family member, friend, romantic partner; see Appendix E for mood prime scripts). Following this prime, participants were instructed to keep their sad autobiographical memory in mind as they listened to the orchestral introduction entitled “Russia under the Mongol Yoke” by Prokofiev (1934) from the film *Alexander Nevsky*, re-mastered at half speed over headphones from a computer for six minutes. Several previous studies have used this methodology to successfully induce a sad mood (e.g., Gilboa & Gotlib, 1977). Meta-analyses assessing negative MIP effectiveness suggest that the combination of instructions to think of a sad autobiographical memory and music result in the largest impact on mood change (Westermann, Stahl, & Hesse, 1996).



**Interpretation Bias.** The Interpretation Bias Questionnaire (IBQ; Wisco & Nolen-Hoeksema, 2010) is a 10- item questionnaire that presents vignettes describing ambiguous daily scenarios. Participants are first asked to imagine that the described scenarios have happened to them. They are then asked to write down all possible reasons for each scenario that come to mind, and to choose the one interpretation that they feel seems the “most likely” explanation. A sample item reads, “You call a good friend of yours and leave a message suggesting getting together later in the week. A few days pass, and you haven’t heard from them. Why haven’t they returned your call?” After completing this process for all ten scenarios, participants are then asked to rate the valence of each of the generated interpretations, rating the positivity and negativity of each interpretation on a 5-point Likert scales ranging from 1 (*not at all*) to 5 (*extremely*). Composite valence scores are then computed for each interpretation by subtracting the negativity score from the positivity score, providing a score ranging from -4 to 4, with higher numbers representing a more positive interpretation. The mean valence of all interpretations generated by each person is used as an index of interpretation generation; the mean valence of the ten interpretations selected as most likely serves as an index of interpretation selection.

Previous research using the IBQ has shown that dysphoric participants generate and select significantly more negative interpretations than do controls (Wisco & Nolen-Hoeksema, 2010). This questionnaire was chosen over similar measures for its ability to assess the generation of explanations rather than solely assessing selection. Further, the generation and selection of explanations is conceptually more ecologically valid when compared to other measures of interpretation bias (e.g., blinking reflex, Lawson,

MacLeod, & Hammond, 2002; homophone tasks, Wenzlaff & Eisenberg, 2001; scrambled sentence tasks, Wenzlaff, Wegner, & Pennebaker, 1993).

**Prime Procedure Feedback.** Following the negative MIP, participants were given a prime procedure feedback questionnaire (PPFQ) developed by the researchers for this study, to assess the effectiveness of the mood prime (see Appendix F). Notably, participants were asked to briefly describe their negative autobiographical memory to verify that individuals' memories were congruent with their assigned prime (i.e., achievement or interpersonal).

**Positive Mood Prime.** A positive mood induction procedure (MIP) was used to elevate negative mood prior to completion of the study. Participants watched a positive movie clip from the film, *The Adventures of Milos and Otis* (Hata, 1986), and were prompted to think about how they would feel if they experienced the situation shown in the movie clip. Previous research has shown that the combination of a positive film clip and explicitly instructions to enter a positive mood state result in the most effective induction of positive mood (Westermann et al., 1996).

### **Procedure**

Upon arrival to the research lab, participants were given the letter of information and asked to provide informed consent if they agreed to participate in the study (see Appendix G). Participants were then seated at a computer, where they first completed the demographics questionnaire, then the BDI-II, followed by the PDST. Then, individuals completed their first VAS mood rating and underwent their randomly assigned negative MIP (achievement or interpersonal). Individuals completed another VAS mood rating, followed by the IBQ and the PPFQ. All participants then underwent the positive MIP and

completed the final VAS mood rating. Following completion of the study, the researcher individually debriefed participants, in which she outlined the purpose of the study, provided research credits for compensation, and gave participants a list of psychological resources which they could contact if in need of support (see Appendix H for debriefing form).

## **Results**

### **Preliminary Analyses**

As mentioned, 11 participants were excluded from the study on the basis of experimenter-recorded behavioural indices indicating that participants did not engage in the task or sufficiently understand the English language. Independent samples t-tests found that the final sample did not differ significantly from the excluded sample on age, education, or BDI-II (all  $p$ s  $> .05$ ). Also, chi-square analyses revealed that excluded participants did not differ significantly from the final sample on gender ( $p > .05$ ). The final sample did differ significantly from the excluded sample on ethnicity,  $X^2(1) = 8.62$ ,  $p = .003$ , indicating that all participants who were excluded were non-Caucasian. Finally, the final sample did not differ significantly from the excluded sample on past experience with therapy or medication for a mental health concern (all values of  $p > .05$ ); however, these analyses and the test of ethnic differences had insufficient cell sizes, thus violating Cochran's rule, and therefore their results should be interpreted with caution.

Preliminary analyses indicated that there were only two missing data points across all questionnaire responses. Tabachnick and Fidell (2013) note that most procedures used for managing missing data yield similar results when a large data set is missing less than

5% of data points and the distribution of missing data is random. As such, the current study used listwise deletion.

### **Descriptive Statistics**

Descriptive statistics including the means and standard deviations for sample demographic variables are presented in Table 1. As shown, the prime-type assigned groups did not differ significantly on any of the demographic variables. As such, none of the demographic variables or BDI-II scores were included as covariates in any of the regression analyses.

Table 1  
*Means and Standard Deviations of the Sample Sociodemographic Characteristics and Differences Between the Interpersonal and Achievement Prime Groups*

Variable	Interpersonal Prime				Achievement Prime				Statistical Test			
	<i>M</i>	<i>SD</i>	<i>n</i>	%	<i>M</i>	<i>SD</i>	<i>n</i>	%	<i>t</i> (155)	<i>p</i>	$\chi^2$ (df)	<i>p</i>
BDI-II	11.99	8.12			13.25	7.45			-1.01	.313		
Age	18.32	1.27			18.31	1.15			0.05	.964		
Education	12.24	0.58			12.17	0.50			.86	.39		
Gender			79	100.0			78	100			<sup>1</sup> 1.27 (2)	.531
Male			25	31.6			22	28.2				
Female			53	67.1			56	71.8				
Transgender			1	1.3								
Ethnicity			79	100.0			78	100			4.18 (4)	.383
Caucasian			41	51.9			30	38.5				
Chinese			12	15.2			18	23.1				
S. Asian			11	13.9			16	20.5				
Mixed			8	10.1			6	7.7				
Other			7	8.9			8	10.3				
Past Therapy			9	11.4			11	14.1			0.259 (1)	.611
Past Medication			5	6.3			8	10.3			0.797 (1)	.373

Note. BDI-II = Beck Depression Inventory = II.

<sup>1</sup>Analysis had insufficient cell sizes, and therefore results should be interpreted with caution.

The means and standard deviations for the inter-stimulus distances for each of the four cognitive vulnerability domains (interpersonal positive, interpersonal negative, achievement positive, achievement negative), the index of interpretation generation and the index of interpretation selection are presented in Table 2. Correlations among prime type, BDI-II, each of the four cognitive vulnerability domains (mentioned above), index of interpretation generation and index of interpretation selection are presented in Table 3.

### **Mood Manipulation Check**

To determine whether the MIP was effective in producing a negative shift in mood, we examined the VAS mood measures. As previously mentioned, participants indicated current mood on a horizontal axis that was anchored with the valence words, *sad* on the leftmost side and *happy* on the rightmost side (scored from 0 to 100 from left to right). A Group (interpersonal prime, achievement prime) by Time (pre-prime, post-prime) repeated-measures analysis of variance (ANOVA) was conducted to ensure the effectiveness of the mood prime procedure. As expected, a significant main effect of time was found,  $F(1, 153) = 164.15, p < .001$ . Participants reported a lower mood rating ( $M = 39.06, SD = 19.44$ ) following the negative mood induction (recall negative memory and sad music) than prior to negative mood induction ( $M = 56.95, SD = 19.85$ ). There was no main effect of Group,  $F(1, 153) = 0.002, p = .962$ , and no significant Group  $\times$  Time interaction effect,  $F(1, 153) = 0.005, p = .944$ . The interpersonal prime group did not show a significantly different decrease in mood from pre- ( $M = 57.06, SD = 19.50$ ) to post- ( $M = 39.08, SD = 18.82$ ) mood induction, relative to the achievement prime group (pre-VAS ratings,  $M = 56.83, SD = 20.33$ ; post-VAS ratings,  $M = 39.04, SD = 20.18$ ).

Table 2  
*Scores on the Predictor and Criterion Variables in the Interpersonal and Achievement Mood Prime Groups*

Variable	Interpersonal Prime	Achievement Prime
	<i>M (SD)</i>	<i>M (SD)</i>
Interpersonal Positive ISD	0.35 (0.19)	0.40 (0.24)
Interpersonal Negative ISD	1.30 (0.45)	1.15 (0.47)
Achievement Positive ISD	0.50 (0.40)	0.52 (0.32)
Achievement Negative ISD	1.28 (0.42)	1.34 (0.57)
Index of Interpretation Generation	-0.40 (0.83)	-0.49 (0.76)
Index of Interpretation Selection	0.29 (1.50)	0.14 (1.23)

*Note.* ISD = Inter-Stimulus Distance, as measured by the PDST.

Table 3  
*Correlations Among the Predictor and Criterion Variables*

	1	2	3	4	5	6	7	8
1. BDI-II		.08	.32**	-.34**	.39**	-.53**	-.27**	-.27**
2. Prime Type			.10	-.15	.03	.06	-.06	-.06
3. Interpersonal Positive ISD				-.19*	.60**	-.31**	-.24**	-.28**
4. Interpersonal Negative ISD					-.07	.55**	.07	.18*
5. Achievement Positive ISD						-.27**	-.17*	-.20*
6. Achievement Negative ISD							.17	.20*
7. Index of Interpretation Generation								.77**
8. Index of Interpretation Selection								

*Note.* ISD = Inter-Stimulus Distance, as measured by the PDST.

\*  $p < .05$ . \*\*  $p < .01$ .



## **Data Analysis**

To test the hypothesis that prime type interacts with schema-structure domain, four separate hierarchical multiple regressions analyses were run to predict generation and selection from schema structure. To keep results parsimonious, both domains (achievement and interpersonal) of negative schema-structure were entered into the same regression model for each of the two outcome variables. This procedure was repeated for the positive schema-structure domains, such that two more regression analyses with the aforementioned outcome variables were conducted. In the first step of all analyses, prime type and schema-structure domains (achievement and interpersonal) were added to test the main effects of schema structure and prime type. In the second step, both interaction variables between prime and schema-structure domain were added. All of the regression analyses followed the aforementioned steps with regards to each of the constructs being assessed. Results for each of these regressions are presented in the tables below.

**Predicting interpretation generation from schema structure.** The first research objective was to determine if schema-structure, when activated by a stressor, acts as a cognitive vulnerability factor to predict negatively biased information processing. A diffusely interconnected positive self-structure and a tightly interconnected negative self-structure was hypothesized to impact the generation of more negative interpretation biases.

The second objective was to assess the congruency hypothesis. Cognitive vulnerability domain and prime type were expected to interact such that when these variables were congruent, participants would generate more negative and fewer positive interpretations of ambiguous scenarios on the IBQ. To address both objectives, two

separate regression analyses (described above) were conducted, where the index of interpretation generation served as the criterion variable in both analyses. Using interpretation generation as the criterion variable, a significant main effect was found for negative-achievement interstimulus distance (see Table 4). Consistent with hypotheses, greater interstimulus distance (less interconnectedness) in the achievement-negative domain was associated with the generation of more positive interpretations of ambiguous scenarios. Also in line with the first hypothesis, a main effect of positive interpersonal interstimulus distance was found, such that greater interstimulus distance (less interconnectedness) in the interpersonal positive domain was associated with the generation of more negative interpretations of ambiguous scenarios. Contrary to hypotheses, no main effects were found for the negative interpersonal or positive achievement schema structure domains. The second hypothesis was also not supported, as no significant interaction effects were found between schema-structure domain and prime type in predicting the generation of negative interpretation biases.

**Predicting interpretation selection from schema structure.** In line with the aforementioned hypotheses, the same effects were expected to hold true with respect to interpretation selection, such that a negative schema-structure would be associated with the selection of more negative interpretations. Also, it was hypothesized that negative schema-structure in a vulnerability domain would interact with prime type to result in the selection of more negative interpretations. Similar to the processes described above, two separate regression analyses were conducted in which negative cognitive organization served as the predictor variable in the first regression, and positive cognitive organization as the predictor in the second. As shown in Table 5, there was a significant main effect of

Table 4  
*Hierarchical Multiple Regression Analyses Predicting Interpretation Generation from Cognitive Organization, Type of Prime, and Cognitive Organization by Prime Interaction*

Predictor	(df) <i>F</i>	<i>R</i>	(df) $\Delta R^2$	$\Delta F$	<i>B</i>	<i>SE</i> of <i>B</i>	$\beta$	<i>t</i>
<b>Predictor: Negative Cognitive Organization</b>								
Step 1:	(3, 119) 2.08	.22	(3, 119) .05	2.08				
Negative Interpersonal ISD					-0.16	0.21	-0.08	-0.78
Negative Achievement ISD					0.42	0.17	0.26	2.40*
Prime Type					-0.005	0.15	-0.003	-0.03
Step 2:	(5, 117) 1.27	.23	(2, 117) .002	0.11				
Negative Interpersonal ISD X Prime					-0.14	0.41	-0.15	-0.34
Negative Achievement ISD X Prime					0.17	0.37	0.23	0.46
<i>R</i> = .23; <i>R</i> <sup>2</sup> = .05; <i>R</i> <sub>adj.</sub> <sup>2</sup> = .01								
<b>Predictor: Positive Cognitive Organization</b>								
Step 1:	(3, 152) 3.17*	.24	(3, 152) .06	3.17*				
Positive Interpersonal ISD					-0.73	0.36	-0.20	-2.06*
Positive Achievement ISD					-0.11	0.22	-0.05	-0.52
Prime Type					-0.06	0.13	-0.04	-0.50
Step 2:	(5, 150)	.25	(2, 150)	.22				
Positive Interpersonal ISD X Prime	1.97 <sup>†</sup>		.003		0.46	0.75	0.25	0.61
Positive Achievement ISD X Prime					-0.26	0.46	-0.20	-0.56
<i>R</i> = .25; <i>R</i> <sup>2</sup> = .06; <i>R</i> <sub>adj.</sub> <sup>2</sup> = .03								

*Note.* ISD = Inter-Stimulus Distance, as measured by the PDST. Recall that lower ISD scores indicate tighter interconnectivity among elements.

\*  $p < .05$ . <sup>†</sup> indicates approaching significance.

Table 5

*Hierarchical Multiple Regression Analyses Predicting Interpretation Selection from Cognitive Organization, Type of Prime, and Cognitive Organization by Prime Interaction*

Predictor	(df) <i>F</i>	<i>R</i>	(df) $\Delta R^2$	$\Delta F$	<i>B</i>	<i>SE</i> of <i>B</i>	$\beta$	<i>t</i>
<b>Predictor: Negative Cognitive Organization</b>								
Step 1:	(3, 119)	.28	(3, 119) .08	3.32*				
Negative Interpersonal ISD	3.32*				0.10	0.33	0.03	0.32
Negative Achievement ISD					0.68	0.28	0.26	2.42*
Prime Type					0.06	0.24	0.02	0.25
Step 2:	(5, 117)	.30	(2, 117) .01	0.66				
Negative Interpersonal ISD X Prime	2.25 <sup>†</sup>				-0.24	0.66	-0.15	-0.36
Negative Achievement ISD X Prime					-0.43	0.60	-0.36	-0.71
					<i>R</i> = .23; <i>R</i> <sup>2</sup> = .09; <i>R</i> <sub>adj.</sub> <sup>2</sup> = .05			
<b>Predictor: Positive Cognitive Organization</b>								
Step 1:	(3, 152)	.28	(3, 152) .08	4.34**				
Positive Interpersonal ISD	4.34**				-1.44	0.61	-0.23	-2.40*
Positive Achievement ISD					-0.24	0.37	-0.06	-0.66
Prime Type					-0.09	0.21	-0.03	-0.41
Step 2:	(5, 150)	.29	(2, 150)	.28				
Positive Interpersonal ISD X Prime	2.70*		.003		0.81	1.25	0.26	0.65
Positive Achievement ISD X Prime					-0.06	0.78	-0.03	-0.08
					<i>R</i> = .29; <i>R</i> <sup>2</sup> = .08; <i>R</i> <sub>adj.</sub> <sup>2</sup> = .05			

*Note.* ISD = Inter-Stimulus Distance, as measured by the PDST. Recall that lower ISD scores indicate tighter interconnectivity among elements.

\*  $p < .05$ . \*\*  $p < .01$ . <sup>†</sup> indicates approaching significance.

negative-achievement interstimulus distance in the prediction of interpretation selection. Consistent with hypotheses, greater interstimulus distance (less interconnectedness) in the achievement-negative domain was associated with the selection of more positive interpretations of ambiguous scenarios. Also in line with the first hypothesis, a main effect of positive interpersonal interstimulus distance was found, such that greater interstimulus distance (less interconnectedness) in the interpersonal positive domain was associated with the selection of more negative interpretations of ambiguous scenarios. Contrary to hypotheses, no main effects were found with respect to the negative interpersonal schema-structure domain or the positive achievement schema structure domain. Contrary to the second hypothesis, no significant interaction effects were found between schema-structure domain and prime type in predicting the selection of negative interpretation biases.

### **Discussion**

The current study had two main objectives: first to determine whether negative cognitive organization (including tightly interconnected negative information about self and diffusely interconnected positive information about self) is predictive of increases in negative interpretation biases following a negative mood prime. The second aim was to evaluate the congruency hypothesis, in determining whether content of a negative mood induction (interpersonal versus achievement) interacts with content domain of schema organization (interpersonal versus achievement) to predict the degree of negative interpretation biases.

With respect to the first objective, individuals with more tightly interconnected negative self-referent representations and/or poorly interconnected positive self-referent

representations were expected to show more negative interpretation biases following a negative mood prime, when compared to those with diffusely connected negative and/or tightly connected positive self-schemas; this hypothesis was predicted to hold true across all domains of cognitive organization (interpersonal positive; interpersonal negative; achievement positive; achievement negative). In line with hypotheses, smaller inter-stimulus distance (more interconnectedness) in the achievement-negative domain was associated with the generation and selection of more negative interpretations of ambiguous scenarios. Also, consistent with the first hypothesis, greater inter-stimulus distance (less interconnectedness) in the interpersonal positive domain was associated with the generation and selection of more negative interpretations of ambiguous scenarios. Contrary to hypotheses, cognitive organization in the achievement positive and interpersonal negative domains was not predictive of the interpretation biases.

While there is limited empirical evidence to guide the predictions for this first objective, from a conceptual standpoint one would anticipate that all four domains of cognitive organization would significantly predict negative information processing, which did not occur. Especially surprising were the null findings with respect to negative interpersonal cognitive organization, given that there is comparatively more literature supporting its sensitivity to depression (Dozois, 2002; Dozois, 2003) and stability outside of depressive episode (Dozois & Dobson, 2001a; Dozois, 2007), when compared to the other structural domains. This finding that achievement negative cognitive structure was predictive of negative information processing biases, whereas interpersonal negative structure was not, might be a function of the student sample used in the present study.

It is conceptually plausible to suggest that the university experience elevates one's susceptibility to academically-relevant stressors over alternative forms of stress, and similar conjectures have been echoed in the literature (e.g., Beiter et al., 2009; Verger et al., 2009). Data collection for the present study also occurred during the same time period as undergraduate mid-term evaluations, which may suggest that achievement-relevant schemas were already naturalistically activated, regardless of the in-lab prime participants received as part of the study. Supporting this suggestion, 47% of the memory descriptions from those assigned to the achievement prime were related to failing an exam or getting a lower grade than expected. This finding speaks to the notion that negative achievement-related schema content may have been more salient than negative interpersonal content in this undergraduate population, thus having a greater influence on information processing.

With respect to the second main effect found, it is presently unclear why a lack of integrated positive interpersonal cognitive structure was also significantly predictive of negative interpretation generation and selection. One possibility is that this finding is also a selection effect due to employing an undergraduate sample; students may have a heightened focus on achievement-related endeavors and associated beliefs, such that the development of interconnectivity among positive beliefs about interpersonal functioning is compromised. That is, an overinvestment of time and energy in achievement-related activities (i.e., academics) may correspond with a reduction in such resources being applied to peer relationships and social functioning; this allocation of time and energy may result in a breakdown of interpersonal positive schema connectivity. Such speculation, in conjunction with the null findings for negative interpersonal schema

structure, aligns with Dozois' (2002) conjecture that a breakdown of positive schemata may occur prior to the consolidation of negative schemata; he notes that such interpretation is consistent with previous evaluations of self-schemas across depressive severity (e.g., Dance & Kuiper, 1987; Ruehlma, West, & Pesahow, 1985). Although admittedly speculative in nature, it is possible that employing other samples outside of an 'achievement context' (i.e., university) may result in a different pattern of main effects. Alternatively, it is possible that the pattern of main effects found in the current study are spurious in nature; as always, replication studies are required to evaluate this conjecture.

One might also examine methodological reasons for the pattern of main effects attained. This pattern does not appear to be a function of the measure of cognitive organization used in this study, or its relation to other variables. For example, examination of Table 3 shows that all domains of cognitive organization were significantly correlated with depressive symptoms ( $r = .32; -.34; .39; \text{ and } -.53$ , for the interpersonal positive, interpersonal negative, achievement positive, and achievement negative domains, respectively). These correlations are comparable with those reported in earlier studies using undergraduate samples (e.g., Seeds, 2007;  $r = .40; -.46; .44; \text{ and } -.48$  for the interpersonal positive, interpersonal negative, achievement positive, and achievement negative domains, respectively).

Alternatively, one might question whether the lack of significant main effects for all schema domains is a function of the measure of interpretation biases used in the current study. Table 3 demonstrates that correlations among indices of interpretation generation and selection and the various domains of cognitive organization ranged in absolute value from .07-.28. While some of these correlations were statistically



significant, the small magnitude of these correlation coefficients prompts one to question whether the IBQ is the best measure to capture depressotypic negative information processing. Although the IBQ has been shown to be sensitive to dysphoria (Wisco & Nolen-Hoeksema, 2010) and conceptually, has enhanced ecological validity when compared to other measures of interpretation biases, it may be that the range of possible scores on this measure does not allow for sufficient variance to meaningfully capture differences across participants (i.e., the measure lacks sensitivity). It is possible that alternative measures of interpretation bias (e.g., Ambiguous Scenarios Test for Depression; Berna, Lang, Goodwin, & Holmes, 2011) would allow for greater variance with which to analyze differences. Alternatively, it is also possible that other forms of information processing may have captured an effect (e.g., Self-Referent Encoding Task; Derry & Kuiper, 1981; e.g., Taylor & Ingram, 1999; Teasdale & Dent, 1987; Timbremont & Braet, 2004).

With respect to the second objective, a significant Prime  $\times$  Cognitive Organization interaction was predicted, such that the negative interpretation biases would be evident when the domain of the prime (interpersonal versus achievement) was congruent with the domain of cognitive organization (interpersonal or achievement) that showed a negative structure. Contrary to hypotheses, no significant Prime  $\times$  Cognitive Organization interactions were found. This lack of findings may be accounted for by several conceptual and methodological reasons.

From a conceptual standpoint, it may be that cognitive organization lacks the specificity required to see Prime  $\times$  Cognitive Organization interactions. That is, it may be that as negative components of schema structure (e.g., interpersonal and achievement

content) become increasingly interconnected and overlap, individuals become increasingly vulnerable to both interpersonal- and achievement-related stressors, rather than solely vulnerable to ‘congruent’ stressors. This interpretation aligns with the theoretical notion that as schemas become further consolidated (i.e., negative beliefs within the schema become further interconnected), the schema can become activated by a wider range of external stressors (Ingram, 1984; Ingram et al., 1998). Thus, interconnectedness within the achievement domain may ‘bleed’ into interpersonal domain, rendering individuals vulnerable to both types of stressors.

Similarly, it may also be the case that stressors in the achievement domain ‘bleed’ into the interpersonal domain, thus activating both types of cognitive structures. That is, rather than being categorical in nature, it may be the case that stressors are better thought of as dimensional constructs that impact cognitions in multiple domains. Supporting this notion, previous research has found that negative social and achievement-related life stressors impact perceptions of self-worth in both the social and achievement domains (Frewin & Dozois, 2006). These authors argue that such findings suggest that the impact of interpersonal and achievement stressors are highly correlated, thus supporting a dimensional perspective of life stressors (Abramson, Alloy, & Hogan, 1997; Kwon & Whisman, 1998; Mischel & Shoda, 1995). Indeed, secondary post-hoc analyses carried out to confirm that individuals recalled a memory consistent with their assigned prime-type revealed that 14 of the 136 descriptions of memories<sup>3</sup> recalled during the prime were rated as ambiguous with respect to their categorization as interpersonal versus achievement. While a strength of the current design was its allowance for individuals to

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<sup>3</sup> Number of memory descriptions coded does not match number of participants analyzed due to missing memory descriptions.

ascribe their own ideographic meaning to life events (rather than post-hoc classification by independent raters), this ambiguity speaks to the fact that both interpersonal- and achievement-related meaning can be assigned to a given event, thus compromising the ability to identify specificity in stressor- vulnerability matching, as predicted by the congruency hypothesis.

One might also plausibly argue that interaction effects would have been found had the interpretation biases been evaluated in a domain-specific manner. That is, rather than using interpretation biases across all domains (i.e., interpersonal and achievement) as the criterion, examining the prediction of biases in such domains separately may have allowed for specificity effects to be detected. This interpretation aligns with the symptom specificity theories, which argue that depressive symptom profiles differ in sociotropic and autonomous individuals (Beck, 1983). Sociotronics are thought to display thoughts of loss, and feeling unlikeable and lonely when depressed, whereas autonomous individuals are thought to display feelings of failure and self-blame. Accordingly, it stands to reason that information processing biases may differ across these personality profiles as well, such that negative biases are only seen in content domains that overlap with their personal vulnerabilities.

As such, exploratory analyses examining the prediction of interpretation biases in the interpersonal- and achievement-relevant scenarios of the IBQ separately were completed. These analyses revealed that the Prime  $\times$  Cognitive Organization interaction term approached significance ( $p = .08$ ), such that increases in the generation of negative *interpersonally-relevant interpretations* were observed when individuals had tightly organized negative interpersonal schema content and underwent an interpersonally-

relevant mood prime (see Appendix I). These observations are qualified by the fact that the IBQ does not formally provide separate interpersonal and achievement scenario subscales; rather, these subscales were derived post-hoc based on the investigator's semantic understanding of each IBQ scenario. Additionally, it is likely that the achievement-related scenarios more readily overlap with interpersonal meaning than vice versa, suggesting limitations with the construct validity of the derived "achievement-subscale" of the IBQ. As such, the findings of these additional exploratory analyses suggest that there is value in exploring these relations using an interpretation bias measure with factor analytically derived interpersonal and achievement subscales. Doing so would allow for a more formal evaluation of whether congruency between stressor and vulnerability yield processing biases in semantically relevant content areas.

A variety of additional methodological reasons might also be considered when attempting to account for the lack of interaction effects found in the current study. One might first question whether participants' recalled memories were consistent with their assigned prime-type condition. As mentioned, secondary post-hoc coding of event descriptions was completed by two independent-raters to evaluate whether memories recalled were consistent with the assigned prime condition. Again, when analyses were re-run using only individuals whose memory description corresponded to their assigned prime-type condition, no significant interactions emerged. Similarly, when exploratory analyses were conducted using the post-hoc classification of memory descriptions as either achievement- or interpersonally-relevant by two independent raters ( $\kappa = .92$ ) still, no significant interaction effects emerged. The results of these additional analyses

suggest that the lack of interaction effects is not due to failure to recall a memory consistent with the assigned prime condition.

Second, one might question whether the prime procedure effectively induced a sad mood state. However, even when various iterations of the analyses were run, including only individuals who achieved a 10%, 20%, 30%, 40% and 50% decrease in mood as measured by the VAS, no significant interaction effects were found. However, it remains possible that although mood did decrease following the prime, post-prime mood was not low enough to observe anticipated effects. That is, while VAS change scores might indicate a mood change, participants still may not have achieved a ‘sad enough’ mood state following the prime. It is possible that aspects of our testing environment may have affected the “intensity” of the prime task. Particularly noteworthy, is that the current study ran six participants at a time in a group setting. The presence of others within the testing room may have influenced the degree to which participants engaged in the prime task. Indeed, several research assistants commented that throughout the mood induction procedure participants often looked around the room at their peers, and appeared to be evaluating whether others were engaging in the priming task. Given the presence of others in the room, it is possible that participants modulated the degree to which they engaged in the task, or the degree of affect they experienced. Although this speculation cannot be quantified, future research is encouraged to explore the potential impact that testing environment has on the effectiveness of mood induction procedures.

A further possibility is that, in addition to sadness, there were several other ‘emotional by-products’ of the mood-induction procedure that confounded the results. For example, previous studies have found similar mood induction procedures (music and

autobiographic memory recall) to evoke increases in irritability and tension, in addition to sad mood (Van der Does 2002). For example, an examination of the Prime-Procedure Feedback Questionnaire showed that one student actually felt that the music also had a calming effect. Thus, it is possible that the priming procedure evoked a wider range of emotions than those directly evaluated in the current study.

Other methodological confounds that interfered with the detection of significant interactions may include the measurement of cognitive organization. An examination of Table 3 shows that inter-stimulus distances in the interpersonal and achievement domains are highly correlated: interpersonal and achievement positive domains have a correlation coefficient of .60, and interpersonal and achievement negative domains have a correlation coefficient of .55. Thus, these two domains as measured by the PDST show significant overlap, which compromises one's ability to detect specificity in prime  $\times$  cognitive organization matching.

Although a portion of this overlap is most likely attributable to shared method variance, one alternative for mitigating this overlap is developing PDST word lists that capture alternative and potentially more informative components of the autonomy/self-critical concept. For example, Frewin and Dozois (2006) note that factor analyses of various measures of autonomy (e.g., Bagby, Parker, Joffe, Schuller, & Gilchrist, 1998 ; Bieling, Beck, & Brown, 2000; Clarke, Steer, Haslan, Beck, & Brown, 1997) suggest that autonomy represents a heterogeneous concept that encompasses social (withdrawal, disinterest), control (dogmatic, and authoritarian) and achievement-related (perfectionistic striving, self-critical) components. They further note additional research that suggests that interpersonal-control components of autonomy may be especially

important when considering risk for depression (Little & Garber, 2000; Mazure, Raghavan, Maciejewski, Jacobs, & Bruce, 2001), but that most evaluations of the congruency hypothesis focus solely on achievement-related constructs. Thus, evaluation of cognitive organization as it relates to alternative components of the autonomy construct (e.g., control) may allow for more specificity, as well as the exploration of potentially more informative components of autonomy.

### **Strengths, Limitations, and Future Directions**

Several strengths of the current design are noteworthy. First, this study is the first of its kind to examine the congruency hypothesis in the context of cognitive organization. Examining congruency in this way allows one to further evaluate whether cognitive organization operates in the manner predicted by theoretical tenets of the cognitive perspective, and adds to the body of literature examining its role as a cognitive vulnerability to depression.

Second, this study is among the select few to examine congruency in the context of information processing, rather than depressive symptoms or episodes (see Appendix A). While examining congruency as it relates to depressive symptoms is certainly informative, evaluating congruency with information processing measures allows one to evaluate the nuances of the cognitive theory of depression (i.e., that activated schemas result in biases in information processing, which then give rise to depression). Thus, using information processing variables such as interpretation biases is more informative when it comes to evaluating the predictions made by cognitive theory.

Finally, rather than using a between-subjects design and classifying participants' personalities as primarily sociotropic versus autonomous, the current split-plot design

evaluated the entire sample in both the analyses of interpersonal and achievement cognitive organization. While it is possible that this approach may have diluted the main effects, this decision more accurately reflects the theoretical standpoint that individuals' personalities do not necessarily reflect one 'pure' subtype (Segal, Shaw, & Vella, 1989). Rather, individuals' personalities likely render them vulnerable to both interpersonal- and achievement- relevant stressors to varying degrees.

Despite these strengths, the current study is not without limitations. First, in the secondary post-hoc analyses to evaluate the effectiveness of the mood prime, it is probable that the removal of individuals for whom the prime did not work (either by failing to induce sad mood or individuals completing the 'wrong' prime condition) significantly reduced the power with which to detect effects. As such, future studies are encouraged to explore moderators of mood induction procedures effects, including personality factors (e.g., conscientiousness), motivational factors (e.g., interest-driven versus compensation-driven enrollment), and testing condition factors (e.g., group versus individual testing). This information would be useful for informing the design of future studies, such that priming methodologies become maximally effective for the largest proportion of participants, allowing for original sample sizes to be retained and statistical power to be maintained.

Second, the current study employed a relatively healthy sample, as evidenced by a mean BDI-II score (12.6) in the non-depressed range (Dozois, Dobson, & Ahnberg, 1998), and the small percentage of participants who had received past therapy (12.0%) or medication (7.8%) for mental health concerns. Given the number of previous studies that have successfully demonstrated negative information processing biases in never-



depressed high-risk samples (e.g., Dearing & Gotlib, 2009; Joormann et al., 2010; Joorman et al., 2007) it is possible that employing a higher-risk sample (e.g., children of depressed mothers) is better suited for an evaluation of cognitive processes in depression, given the presumably greater presence of the cognitive vulnerabilities under investigation.

Finally, the current study was limited in that data were collected in a laboratory environment, suggesting that testing conditions may have been too artificial and immediate (i.e., the time delay between ‘stressor’ and evaluation of negative information processing was too short) to capture true effects. Thus, future studies might benefit from employing designs that incorporate an evaluation of naturalistic stressors (through methods such as diary studies) over larger time delays to evaluate the temporal associations among cognitive vulnerabilities, external stressors, and negative changes in information processing.

Future research might also evaluate whether different schema content domains (i.e., interpersonal and achievement content) are in fact organized in separate schema structures. While the literature on cognitive organization stability suggests that they are indeed captured in unique structures (e.g., Dozois, 2007; Dozois et al., 2009; Dozois & Frewen, 2006) given the lack of specificity findings in the current study, one might also suggest that as negative schema structure becomes more interconnected various domains of negative content begin to overlap, thus making all negative nodes more readily activated. Clinically, this proposal could present as an individual more readily recalling negative information from multiple content domains (e.g., interpersonal- and achievement-relevant information) when triggered by a single stressor. Empirical

evaluations of such questions allow for improved understanding of the mechanisms contributing to negative information processing in depression.

### **Summary and Conclusions**

The current study examined whether cognitive organization of self-referent information was predictive of negative information processing biases following activation by a negative mood prime. Cognitive organization in the achievement negative and interpersonal positive domains was predictive of negative information processing biases; however, cognitive organization in the achievement positive and interpersonal negative domains was not predictive of these biases. This study also evaluated the congruency hypothesis, by examining whether content of a prime (interpersonal or achievement) interacted with content of cognitive organization to predict negative interpretation biases. Contrary to predictions, no significant interaction effects were found; however, additional analyses suggested that interaction effects may be attained when using domain-specific measures of information processing. Alternatively, cognitive organization domains may begin to overlap as schema content becomes increasingly consolidated. Future empirical examinations are required evaluate such alternatives.

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## Appendix A

## Congruency Review Table

Authors	Type of Design	Type of Sample	Vulnerability Measure	Type of Stressor	Outcome Measure	Findings
<b>Studies Showing Support for Congruency</b>						
Lam, Green, Power, & Checkley (1994)	6- week prospective	37 depressed patients	The Roles and Goals Questionnaire: ratings of importance and effort in four life domains (work; interests/hobbies; relationships; health)	Life Events and Difficulties Schedule; events pre-classified	Recovery from depressive symptoms	Logistic regression analyses revealed that experience of adversity in the most invested domain significantly contributed to the prediction of recovery; this contribution was more significant than that predicted by adversity in general
Robins (1990b)	Cross-sectional	82 undergraduates	SAS- Sociotropy and Autonomy Scales	LES; stressors classified by participants	Number of each type of event recalled & impact rating of event	ANOVA analyses revealed that for depressed undergrads, those high in sociotropy recalled more social than autonomy events, and those high in autonomy recalled more autonomy than social events; this difference occurred at a trend level; no significant effects reported for non-depressed sample.

Pueschel, Schulte & Michalak (2011)	Cross-sectional	61 psychotherapy outpatients	Individuals' motives were assessed with a Picture Story Exercise	Self-report assessment of progress towards goals	Depressive symptoms	Correlational analyses revealed that only motive-congruent goal progress was associated with depressive symptoms; motive-incongruent goal progress did not account for differences in depressive symptoms.
Segal, Shaw, Vella, & Katz (1992)	12-month prospective	59 remitted depressives	DAS-Self-Critical and Dependency Scales	Naturalistic stressors as assessed by the Psychiatric Epidemiology Research Inventory; stressors classified by investigators	Depressive relapse	Hierarchical multiple regression analyses revealed significant achievement $\times$ # of achievement events interaction; achievement $\times$ stress rating of achievement events interaction; dependency $\times$ stress rating of interpersonal event interaction only obtained when examining life events 2-months prior to relapse
Frewen & Dozois (2006)	Retro-spective design	188 undergraduate students	Personality Style Inventory-II	Subset of items from the Life Events of	Depressive symptoms	Regression analyses revealed significant interactions between

				College Students Checklist and the Inventory of College Students' Recent Life Experiences; events categorized by investigators		personality-congruent negative life events and sociotropy, autonomy (perfectionism/self-criticism), and autonomy (need for control)
Lam, Green, Power, & Checkley (1996)	1-year follow-up	30 previously depressed patients	The Roles and Goals Questionnaire-ratings of importance and effort in four life domains (work; interests/hobbies; relationships; health)	Life Events and Difficulties Schedule; events pre-classified	Depressive relapse	Chi square analyses revealed that individuals who experienced an adversity in their vulnerability domain had a 3-fold chance of relapse compared to those with a nonmatching adversity; 7/8 of the matching adversities were in the interpersonal domain

Hammen, Marks, Mayol, & deMayo (1985)	4-month prospective	93 undergraduate students	Recall of life events rated as interpersonal or achievement by investigators; ratio of # of each type of event used to classify vulnerability	Life Events Survey developed by the investigators & Life Stress interview; stressors classified by investigator	Depressive symptoms	Tests of equality of correlations revealed a stronger relation between depression and interpersonal events for dependent than self-critical individuals; stronger relation between depression and achievement events for self-critical than dependent individuals, although the latter was less often significant.
Hammen & Goodman-Brown (1990)	6-month prospective	64 children of depressed, bipolar, medically ill, or healthy mothers	Information Processing Task (recall of specific memories)	Life stress interview; stressors categorized by investigators	Depressive symptoms	Chi square analyses suggest an association between increased depression and prior life events that are congruent with schema subtype; this effect was especially marked for sociotropic individuals.

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**Studies Showing Mixed Support for Congruency**

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Raghavan, Le, & Berenbam (2002)	Cross-sectional	39 females from the community	Abbreviated Personality Style Inventory-Autonomy and Sociotropy Scale	Naturalistic: SEPRATE Semi-structured interview;	Dysphoria and hostility	Logistic regression analyses revealed a significant sociotropy × interpersonal stressor interaction in the
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				stressor classified by investigators		prediction of depression; hierarchical multiple regression revealed a significant autonomy × achievement stressor interaction in the prediction of hostility
Uhrlass, Crossett, & Gibb (2008)	6- month prospective	100 children from the community	Self-Perception Profile for Children- Social Acceptance and Scholastic Competence Scales	Naturalistic: Relational victimization subscale of the Social Experiences Questionnaire	Depressive symptoms	Hierarchical linear modelling revealed that low self-perceived social acceptance (but not scholastic competence) moderated the association between relational victimization and depressive symptoms in girls, but not in boys.
Segal, Shaw, & Vella, 1989	6-month prospective	10 dependent and 16 self- critical remitted depressed patients	DAS- Dependent and Self-Critical Scales	Naturalistic stressors as assessed by the Psychiatric Epidemiology Research Inventory; stressors classified by investigators	Depressive relapse	3-way MANOVA revealed that dependent participants have greater relapse following interpersonal rather than achievement events; self- critical participants relapsed regardless of type of stressor
Bartel-	Cross-	166	DEQ and SAS (all	Naturalistic	Depressive	Hierarchical multiple



stone & Trull (1995)	sectional	undergraduates with depressive symptoms	scales)	stressors as assessed by the LES; stressors classified by investigators	Symptoms (BDI)	regression revealed a significant SAS sociotropy × interpersonal events interaction; DEQ dependency × interpersonal events interaction; DEQ self-criticism × interpersonal events interaction
Voyer & Cappelliez (2002)	6-month prospective	41 remitted-depressives from outpatient program	DAS-Self-Critical and Dependency Scales	Naturalistic stressors as assessed by the Recent Life Change Questionnaire-Modified; stressor classified by investigators; impact of event rated by participants	Depressive relapse	Hierarchical regressions revealed a dependency × impact on social network interaction; achievement × impact on functional autonomy interaction approached significance; significant main effect of impact on social relations for both autonomous and dependent individuals.
Dozois & Backs-Dermott (2000)	Cross-sectional	127 undergraduates (females only)	SAS-Sociotropy Scale	Experimental: Audiotaped presentations of rejection of failure	Information Processing Measure (Interpersonal Stroop Task)	ANOVA analyses suggested that following the rejection stressor, those high in sociotropy endorsed more negative

				episodes		adjectives and fewer positive adjectives than those low in sociotropy; this difference was not found in the failure stressor condition.
Allen, Horne, & Trinder (1996)	Cross-sectional	100 undergraduate students	Personality Style Inventory-Dependency and Achievement-Autonomy Scales	Experimental: Social rejection and achievement failure imagery scenes	Physiological (heart rate and corrugator EMG) and self-report ratings of emotion	Hierarchical multiple regression revealed that sociotropy was a significant predictor of dysphoria in response to the social rejection prime, and to a lesser extent the achievement failure prime; autonomy was not a vulnerability factor for either type of prime
Robins (1990a)	Cross-sectional	78 depressed patients and 44 schizophrenic patients	SAS- Sociotropy and Autonomy scales.	Schedule for Recent Events; stressors classified by investigators	Number of each type of event recalled	ANOVA analyses suggested that depressed patients high in sociotropy recalled more negative interpersonal events than achievement events and more interpersonal events than did depressed patients high in autonomy; no support for congruence in non-depressed schizophrenic patients

Zuroff & Mongrain (1987)	Priming and symptom ratings completed cross-sectionally 4-6 weeks after DEQ completion	45 female college students	DEQ	In lab prime: audiotaped portrayals of rejection by a boyfriend and of failure to be accepted into graduate school	Dependent and self-critical depression	ANOVA analyses revealed that dependent subjects' depressive symptoms were specific to the rejection prime; self-critical participants reported self-critical depression in response to both failure and rejection primes.
Abela, McIntyre-Smith, & Dechef (2003)	Cross sectional	136 high school students	DEQ & SAS (all scales)	CPQ: Recall of the most stressful event that had occurred in the past year; stressors classified by investigators	Type of event recalled	Chi square analyses revealed that dependent and sociotropic students were more likely to recall an interpersonal event than achievement event. Self-critical students were more likely to recall achievement events than interpersonal events. Autonomous individuals were more likely to recall an interpersonal event.
Hammen, Ellicott, Gitlin, & Jamison	6-month prospective	22 depressed patients	SAS- Sociotropy and Autonomy scales.	Semi-structured interview; stressors	Depressive symptoms	Independent samples t-test revealed that autonomous clients with achievement stressors were more

(1989)				classified by investigators		symptomatic than those with interpersonal stressors; sociotropic patients with interpersonal stress were more symptomatic than those with achievement stress, although this differences was not significant
Hammen, Ellicott, & Gitlin (1989)	3-month prospective	27 Depressed outpatients	SAS-Sociotropy and Autonomy scales	Life events interview; stressors classified by investigator	Depressive symptoms	Within subjects t-test revealed that individuals had significantly more congruent life events than incongruent events; regression analyses revealed a significant autonomy × achievement life events interaction; the sociotropy × interpersonal events interaction was not significant
<b>Studies Failing to Support Congruency</b>						
Cogswell, Alloy, & Spasojevic (2006)	2.5 year prospective	168 non- depressed undergraduates classified as low/high risk based on CSQ	DEQ- Neediness and Connectedness Sub-Factors	Naturalistic stressors as assessed by the LES & Stress Interview; stressors	DSM-III-R Major Depressive Episode	Hierarchical logistic regression revealed no significant neediness x stress interactions

		and DAS scores		classified by investigators		
Robins, Hayes, Block, & Kramer & Villena (1995)	6-month prospective	160 undergraduate students	SAS & Revised DEQ (all subscales)	Naturalistic stressors as assessed by the Life Experiences Survey; stressors classified by investigators	Depressive symptoms	Hierarchical multiple regression revealed significant sociotropy $\times$ frequency of interpersonal events interactions; sociotropy $\times$ frequency of achievement events interaction; autonomy $\times$ frequency of interpersonal events interaction; autonomy $\times$ frequency of achievements events
Robins & Block (1988)	Cross-sectional	98 undergraduates	SAS- Sociotropy and Autonomy scales	Life Events Inventory-stressors classified by investigators	Depressive symptoms	Hierarchical multiple regression revealed a sociotropy $\times$ interpersonal events interaction; a sociotropy $\times$ autonomous events interaction; no evidence for autonomy being a vulnerability to any type of life event
Lahey & Ross (1994)	10-12 week prospective	133 students	Brief DEQ	College Student Life Events Schedule;	Depressive symptoms	Hierarchical multiple regression revealed a significant dependency $\times$ interpersonal events

				participants indicated roles each life event impacted, and roles were classified by investigators		interaction; a self-criticism × interpersonal events interaction; and a marginally significant self-criticism × achievement events interaction.
Kwon & Whisman (1998)	6- and 12-week prospective	147 undergraduate students	Personality Style Inventory, Version II	Life Experiences Survey; stressors classified by investigators	Depressive symptoms	Hierarchical multiple-regression analyses revealed no significant interactions between personality style and life events.
Iacoviello, Grant, Alloy, & Abramson (2009)	2.5 year prospective	159 undergraduates with at least one prospective depressive episode	SAS-Sociotropy and Autonomy scales; Sociotropy Subscales included: Fear of Criticism and Rejection and Preference for Affiliation; Autonomy Subscales included: Independent Goal Attainment and Sensitivity to Others' Control	Life Events Scale; stressors classified by investigators	Depressive episode duration, chronicity, number of episodes, and severity	Hierarchical multiple regression analyses revealed no anticipated sociotropy × interpersonal interactions or autonomy × achievement interactions.  The following interactions were significant: - Sociotropy: Fear of criticism and Rejection × Achievement events when predicting chronicity, # of episodes, severity

						- Autonomy: Independent Goal Attainment × interpersonal events when predicting chronicity - Autonomy: Sensitivity to others' control × interpersonal events when predicting number of depressive episodes, severity
Smith, O'Keefe, & Jenkins (1988)	Cross-sectional	188 college students	Depressive Experiences Questionnaire-self-criticism and dependency subscales	Life Experiences Survey-event classification not specified	Depressive symptoms	Regression analyses revealed no evidence of event-type and personality-type matching in predicting depression.
Clark, Beck, & Brown (1992)	Cross-sectional	438 students	SAS-Aociotropy and Autonomy scale	Negative Experiences Inventory; stressors classified by investigator	Depressive symptoms	Regression analyses revealed a significant sociotropy × frequency of negative social events interaction; autonomy × negative social events interaction

*Note.* DEQ = Depressive Experiences Questionnaire; SAS = Sociotropy & Autonomy Scales; CSQ = Cognitive Styles Questionnaire; DAS = Dysfunctional Attitudes Scale; MDE = Major Depressive Episode; LES = Life Events Scale; BDI = Beck Depression Inventory; CPQ = Cognitive Priming Questionnaire; DSM = Diagnostic and Statistical Manual of Mental Disorders.

## Appendix B

## Demographics

Age: \_\_\_\_\_

Gender:

Male

Female

Transgender

Prefer not to disclose

Other (please specify): \_\_\_\_\_

I would describe myself as:

Heterosexual

Gay or lesbian

Bisexual

Queer

Uncertain or questioning

I choose not to answer

Other (please specify): \_\_\_\_\_

Ethnicity: (circle all those that apply)

Caucasian

Filipino

Chinese

Latin American

Korean

Black

Arab

Japanese

South Asian (e.g. East Indian, Sri Lankan, etc.)

Southeast Asian (e.g. Vietnamese, Cambodian etc.)

West Asian (e.g. Iranian, Afghan, etc.)

Aboriginal (that is, North American Indian, Métis or Inuit)

Other (please specify): \_\_\_\_\_

Don't Know

Please indicate the number of years of education you have completed to date (e.g. if you have completed grade 12 you would indicate '12 years', if you have completed one year of undergraduate studies you would indicate '13 years', if you have completed a 4 year undergraduate degree you would indicate '16 years'): \_\_\_\_\_

Have you ever received any therapy or counseling for an emotional or psychological problem? Yes/No

If yes, please describe: \_\_\_\_\_



Have you ever taken any medication for an emotional or psychological problem? Yes/No

## Appendix C

## Psychological Distance Scaling Task Word Lists

**INTERPERSONAL POSITIVE**

ADMIRED  
CARING  
COMFORTED  
COMICAL  
CONSIDERATE  
DESIRABLE  
DEVOTED  
ENCOURAGED  
GENEROUS  
HUMOROUS  
JOYFUL  
KIND  
PLAYFUL  
OUTGOING  
NEIGHBOURLY  
ROMANTIC  
SUPPORTED  
TRUSTWORTHY  
UNDERSTANDING  
VALUABLE

**INTERPERSONAL NEGATIVE**

ALONE  
ANNOYING  
CONCEITED  
DEMANDING  
DEPENDENT  
DESERTED  
SHY  
FORSAKEN  
DULL  
LONELY  
OVERBEARING  
PUSHY  
QUARRELSOME  
REJECTED  
RESENTFUL  
SHUNNED  
SNOBBISH  
UNFRIENDLY  
UNLOVED

UNWANTED

**ACHIEVEMENT POSITIVE**

ACHIEVING  
AMBITIOUS  
CAPABLE  
DRIVEN  
EAGER  
EFFICIENT  
EXCEPTIONAL  
GIFTED  
IMPRESSIVE  
INTELLIGENT  
EXTRAORDINARY  
OUTSTANDING  
MARVELLOUS  
REMARKABLE  
RESPECTED  
SKILLFUL  
STRIVING  
SUCCESSFUL  
SUPERIOR  
TALENTED

**ACHIEVEMENT NEGATIVE**

AIMLESS  
APATHETIC  
BEATEN  
CRITICIZED  
DEFEATED  
DEFICIENT  
DESTROYED  
FAILURE  
HASTY  
HELPLESS  
HURRIED  
INADEQUATE  
INCOMPETENT  
INFERIOR  
INSIGNIFICANT  
LAZY  
STAGNANT  
STUPID  
USELESS  
WORTHLESS

Appendix D  
Visual Analogue Scale

Please indicate how you feel right now by placing an “X” on the line.



Sad Happy

## Appendix E

### Prime Scripts

#### **Interpersonal Prime**

In this part of the experiment, you will listen to a sad piece of music that is meant to create a temporary sad mood state. While listening to the music, we would also like you to try to recall a time in your life when you felt sad, due to a negative experience in a relationship with a close other. For example, you could recall a time when you broke up with a past romantic partner, or an ending of a close friendship, or an argument with a close family member. Please take a moment now to think of a time in your life when you felt sad, due to a negative experience in a relationship with a close other [pause]. To help create a sad mood, please try to vividly imagine your memory, and re-experience how you felt when it happened. Please keep this memory in mind while the music plays for the next six minutes.

#### **Achievement Prime**

In this part of the experiment, you will listen to a sad piece of music that is meant to create a temporary sad mood state. While listening to the music, we would also like you to try to recall a time in your life when you felt sad, due to a failing to achieve a desired achievement related goal. For example, you could recall a time when you did really poorly on an important exam, or failed to get a job or role that was important to you, or received a poor evaluation of your performance. Please take a moment now to think about a time in your life when you felt sad, due to failure to achieve a desired

achievement related goal [pause]. To help create a sad mood, please try to vividly imagine your memory, and re-experience how you felt when it happened. Please keep this memory in mind while the music plays for the next six minutes.



## Appendix G

### Letter of Information

**Project Title:** The Effects of Thinking on Mood and Mood on Thinking

**Principal Investigator:** David Dozois, PhD, Western University

**Co-Investigators:** Lindsay Szota, MSc candidate, Western University

### Letter of Information

#### **1. Invitation to Participate**

This study explores the cognitive predictors of responses to changes in mood. You have been invited to participate in an in-lab session that will take approximately 2 hours. You will be compensated with 1 research credit per hour toward PSYC1000 for participating in this study. If you are enrolled in a course other than Psych 1000, your compensation will be based on your course outline. If you have any questions about the time or compensation, please feel free to contact the investigators before you consider signing the consent.

#### **2. Purpose of the Letter**

The purpose of this letter is to provide you with information required for you to make an informed decision regarding participation in this research.

#### **3. Purpose of this Study**

The purpose of this study is to examine how people organize information and beliefs about the self, and how this relates to changes in thinking and mood. This will help us to better understand the factors involved in the onset and maintenance of sad mood, which is an area in need of further research.

#### **4. Inclusion Criteria**



Individuals who are students at Western University are eligible to participate in this study. Since the study includes tasks involving the comprehension of English words you must be confident that you are able to recognize and understand the meaning of university-level vocabulary words without the use of outside aids.

## **5. Exclusion Criteria**

Individuals who are not students at Western University are not eligible to participate in this study. This study is not suitable for individuals who require a translator application in order to understand the meaning of English words. Additionally, individuals who have previously completed the Mood Lab study entitled, "Romantic Relationships and Mood" are not eligible to participate in this study.

## **6. Study Procedures**

There is one in-lab session conducted in the Mood Lab at Western University. At this session, you will be asked to complete a series of tasks and questionnaires that will ask you about your mood and beliefs about yourself. You will also undergo a mood priming procedure during which you will be asked to listen to some sad music while thinking about a sad time in your life, which will be followed by some more questionnaires/tasks. You will also be asked to complete one additional questionnaire designed to inform future research studies in the lab. This session will take approximately 2 hours. After the session, you will be debriefed by the researcher. You may withdraw from the session at any time should you decide you would no longer like to participate, without any loss in compensation for the session. Similarly, refusal to answer questions will not result in loss of compensation.

## **6. Possible Risks and Harms**

You may experience some mild discomfort when completing the questionnaires and/or tasks, but this should be transient. As part of the study we will be inducing a sad mood state, however research shows that such state is temporary in nature, and tends to dissipate within 10 minutes (e.g. Isen & Gorglione, 1983; Segal & Ingram, 1994). Further, you will be provided with a debriefing form at the end of the session that provides resources on campus and in the community that you can use if you are distressed.

## **7. Possible Benefits**

The benefits of participating in this study are likely to outweigh the risks. Participants will be afforded an opportunity to gain greater insight into their own personal beliefs about themselves. Additionally, information gathered may provide benefits to society as a whole, including learning more about the course of depression and its associated risk factors. Finally, this study gives you the opportunity to learn more about how psychological research is conducted.

## **8. Compensation**

You will be compensated with 1 research credit per hour toward PSYC1000 for participating in this study. If you are enrolled in a course other than Psych 1000, your compensation will be based on your course outline. If you have any questions about the time or compensation, please feel free to contact the investigators before you consider signing the consent.

## **9. Voluntary Participation**

Participation in this study is voluntary. You may refuse to participate, refuse to answer any questions or withdraw from the study at any time with no effect on your academic status, relationship to the university, or your degree of compensation. If you refuse to participate partway through the study, any data collected up to that point will not be used.

## **10. Confidentiality**

All data collected will remain confidential and accessible only to the investigators of this study. While we do our best to protect your information there is no guarantee that we will be able to do so; if data are collected during the project which may be required to report by law we have a duty to report. Data is stored by Western University Psychology Department's secure server and all forms are stored in locked filing cabinets. If the results are published, your name will not be used. If you choose to withdraw from this study, your data will be removed and destroyed from our database. All data will be destroyed 5 years after study completion.

## **11. Contacts for Further Information**

If you require any further information regarding this research project or your participation in the study you may contact the Principal Investigators:

If you have any questions about your rights as a research participant or the conduct of this study, you may contact The Office of Human Research Ethics

## 12. Publication

If the results of the study are published, your name will not be used. If you would like to receive a copy of any potential study results, please contact Lindsay Szota at

*This letter is yours to keep for future reference.*

### Consent Form

**Project Title:** The Effects of Thinking on Mood and Mood on Thinking

**Study Investigators' Names:**

Lindsay Szota, MSc candidate, Western University

David Dozois, PhD, Western University

I have read the Letter of Information, have had the nature of the study explained to me and I agree to participate. All questions have been answered to my satisfaction.

Participant's Name (please print):

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Participant's Signature:

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Date:

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Person Obtaining Informed Consent (please print):

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Signature:

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Date:

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**Project Title:** The Effects of Thinking on Mood and Mood on Thinking

Thank you for participating in our study! In doing so, you have contributed to knowledge in the field of clinical psychology.

This study is examining the relationship between the organization of positive and negative self- attributes (adjectives) and reactions to a sad mood. During the study, you were asked to place adjectives on a 2-dimensional graph on the computer depending on how much the adjective referred to you and whether you perceived that adjective as positive or negative. You were also asked to rate your current mood before and after listening to sad music and thinking about a sad time in your life (mood prime procedure). We are looking to see if how you organize adjectives about yourself predicts how strongly your mood changes in response to the sad mood prime procedure, and whether these changes in mood predict negative patterns in thinking. We are also looking to see if these processes are influenced by the type of sad memory you recalled.

It is hoped that this study will contribute to a better understanding of vulnerability factors that influence the development and maintenance of depression. This information will also add to the existing literature base regarding how our thoughts influence the development of depression, as well as potentially inform future clinical practice.

Please be assured that all of your responses in this experiment are anonymous and will be used for research purposes only. Your name will not be recorded on your questionnaires or associated with your answers. In order to reduce the possibility that other participants will be biased by preconceptions about this study, we would greatly appreciate if you would not discuss the details of this study with your fellow students.

Thank you again for your participation in this study!

Sincerely,

Lindsay Szota, M.Sc. candidate

**Should you have any questions or concerns about this study, or would like additional information about accessing psychological resources, please contact:**

**Below are a variety of resources if you are interested in learning more about depression, how you can help yourself, or how you can arrange for professional help.**

**Self-Help References:**

If you would like to look up some good self-help books on changing negative thinking, please see:

- ❖ Burns, D. D. (1980). *Feeling good*. New York: Penguin.
- ❖ Burns, D. D. (1989). *The feeling good handbook*. New York: Penguin.
- ❖ Greenberger, D., & Padesky, C. A. (2015). *Mind over mood: Change the way you feel by changing the way you think, 2<sup>nd</sup> edition*. Guilford Press.
- ❖ Wright, J. H., & McCray, L. W. (2011). *Breaking free from depression: Pathways to wellness*. Guilford Press

### Available Services

There are several ways in which individuals can access psychological or psychiatric help both on campus and within the City of London, Ontario. If you are feeling depressed or anxious or feel that you could benefit from some individual assistance, the following information may be of use to you.

#### The Student Development Centre at the University of Western Ontario

- Individual appointments are available for students. To make an appointment you can call , or you can make an appointment in person at the Reception Desk, Room 4100 of the Western Student Services Building.
  - Psychological Services Staff will make every effort to respond as quickly as possible when an individual student requires an emergency appointment.
  - Psychological Services Staff can help you deal with a variety of issues including those related to Traumatic Events, Sexual or Physical Assault, Date rape, Interpersonal Violence, and Gay, Lesbian, Bisexual, or Transgendered situations.
- More information about the services offered at SDC can be found on the World Wide Web at <http://www.sdc.uwo.ca/>

#### London Crisis Centres

Psychological Services Staff will make every effort to respond as quickly as possible when an individual requires an emergency appointment. If you are in crisis when the office is closed please call one of the numbers listed below.

- **Mental Health Crisis Centre:**
- **Sexual Assault Centre London Crisis Line:**
  - Also 24 hour support line for sex trade workers:
- **Women's Community House Help Line:**
  - Out-of-Town calls:
- **Zhaawanong (Atenlos) Shelter:**
  - Outside of the London area code:
  - 24 hour crisis line:
- **St. Joseph's Sexual Assault and Domestic Violence Centre:**

### **Student Health Services Counselling Centre**

- SHS is located in **Room 11, (Lower Level) University Community Centre, U.W.O.**
- Main telephone line:
- The Student Health Services Counselling Centre provides individual counselling for students. The Counselling Centre can be reached at
  - The Counselling Centre's Hours of Operation are as follows: Monday to Friday 8:30 a.m.- 4:30 p.m. (Please note the Counselling Centre will be closed when the university is closed.)

### **London & District Distress Centre**

- This is a 24-hour Distress Line:
  - Crisis Response Line: (
  - Access by e-mail at:
  - Each problem is handled in an atmosphere of confidentiality, anonymity & impartiality. You do not have to give your name nor does the service use call display; they will not try to identify the caller.

### **Addiction Services of Thames Valley**

- Alcohol & Drug Services of Thames Valley is located at **200 Queens Ave., Suite 260, London, Ontario N6A 1J3**
  - A community service, funded by the Provincial Ministry of Health, Ontario Substance Abuse Bureau. There are currently no charges for clinical services, although fees may be charged for training or seminars.
  - Service is available to any resident of Middlesex, Elgin or Oxford County. There are no admission restrictions.
  - Provide early intervention to persons who are concerned about substance use and/or problem gambling.
  - ADSTV is a gay, lesbian, bisexual, transsexual, and transgender positive environment
  - Services include assessment of individuals who have an alcohol and/or drug related problem. Assessments are also available for problem gambling. Based on these assessments the ADS will develop treatment plans for clients and assist with referrals to provide outpatient counselling and aftercare.
  - Hours of operation in London are as follows: Monday to Friday - 8:30 a.m. to 4:30 p.m.; Tuesdays- 8:30 a.m. to 9:00 p.m. (closed 12 until 1 p.m. each day and 4:30 to 5:30 p.m. on Tuesdays).
  - Self-referrals are welcome, call (extension 222 for substance abuse services, extension 234 for problem gambling services).

### **Emergencies After Hours**

- If you are in distress during an after-hours time, please go to the **nearest hospital emergency room.**
  - **On Campus:** University Hospital:, 339 Windermere Rd.
  - **South London:** Victoria Hospital:, 800 Commissioners Rd. East

- **North London:** St. Joseph's Hospital:, 268 Grosvenor Rd.

### **Referrals to Other Resources**

- Family physicians can provide you with counselling services, and can make referrals to other community resources as needed.
- Specialized services for emotional and interpersonal problems are available, however, a referral from a physician is often necessary.

We hope that this information is helpful to those who need it.

If you are suffering from distress, we encourage you to seek help from an appropriately qualified individual or service centre. Please contact a University or Community Agency that can help you, or to speak with a physician who can refer you to the appropriate resource.

## **Appendix I**

### **Secondary Analyses**



Given the speculation that interaction effects may have been found had interpretive biases been analyzed in the interpersonal and achievement domains separately, exploratory analyses examining the prediction of interpretation biases separately in each domain were completed. As shown in Table I1, these analyses revealed that the Prime  $\times$  Cognitive Organization interaction term approached significance ( $p = .08$ ). Consistent with hypotheses, this interaction revealed that more negative *interpersonally-relevant* interpretations occurred when individuals had tightly organized negative interpersonal schema content (i.e., less inter-stimulus distance) and underwent an interpersonally-relevant mood prime (see Figure I1). Similar analyses were run to predict the generation of *achievement-relevant interpretations* (see Table I2); however, none of the interaction terms in these analyses approached significance. Similarly, no interaction terms in the analyses of domain-specific interpretation *selection* approached significance, and are thus not presented.

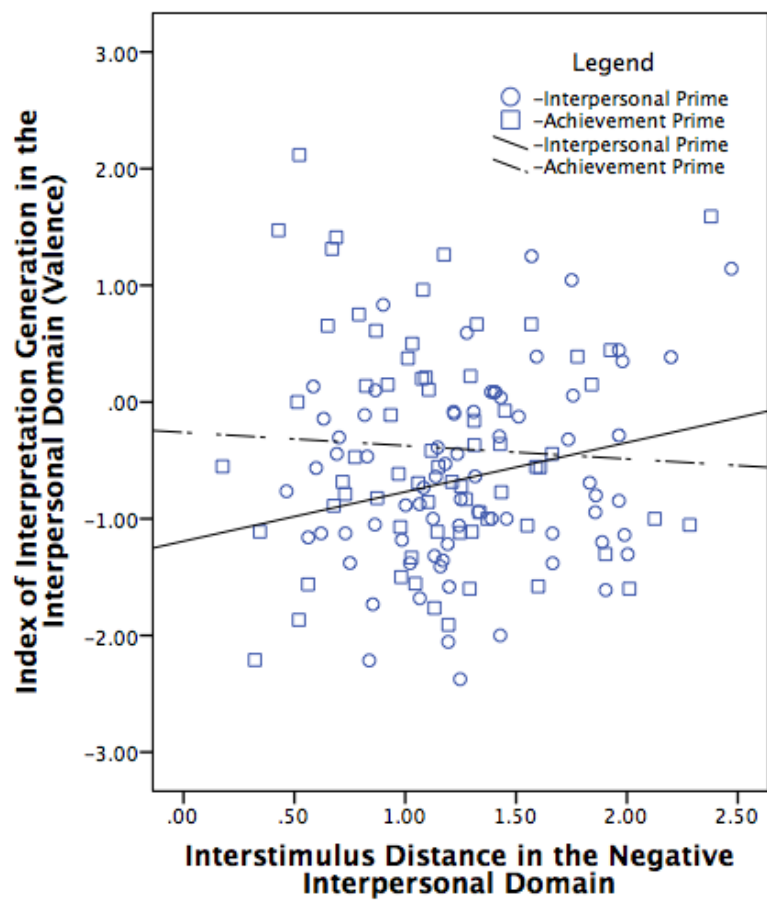
Table II

*Hierarchical Multiple Regression Analyses Predicting Interpersonal Interpretation Generation from Cognitive Organization, Type of Prime, and Cognitive Organization by Prime Interaction*

Predictor	(df)F	R	(df) $\Delta R^2$	$\Delta F$	B	SE of B	$\beta$	t
<b>Predictor: Interpersonal Cognitive Organization</b>								
Step 1:	(3, 140) 1.29	.17	(3, 137) .03	1.29				
Negative Interpersonal ISD					0.16	0.17	0.08	0.95
Positive Interpersonal ISD					0.06	0.34	0.01	0.16
Prime Type					0.27	0.15	0.16	1.82 <sup>†</sup>
Step 2:	(5, 135) 1.46	.23	(2, 135) .02	1.70				
Negative Interpersonal ISD X Prime					-0.59	0.33	-0.59	-1.78 <sup>†</sup>
Positive Interpersonal ISD X Prime					-0.56	0.71	-0.28	-0.80
					$R = .23; R^2 = .05; R_{adj.}^2 = .02$			
<b>Predictor: Achievement Cognitive Organization</b>								
Step 1:	(3, 132) 1.92	.21	(3, 132) .04	1.92				
Negative Achievement ISD					-0.15	0.16	-0.09	-0.96
Positive Achievement ISD					0.14	0.21	0.06	0.67
Prime Type					0.30	0.15	0.17	2.02 <sup>*</sup>
Step 2:	(5, 130) 1.24	.21	(2, 130) .004	0.24				
Negative Achievement ISD X Prime					-0.19	0.34	-0.24	-0.56
Positive Achievement ISD X Prime					-0.24	0.44	-0.17	-0.55
					$R = .21; R^2 = .05; R_{adj.}^2 = .01$			

Note. ISD = Inter-Stimulus Distance, as measured by the PDST. Recall that lower ISD scores indicate tighter interconnectivity among elements.

\*p < .05; † Indicates approaching significance.



*Figure II.* Relation between inter-stimulus distance in the negative interpersonal domain and valence of *interpersonally-relevant* interpretation biases across the two types of mood primes.

Table I2

*Hierarchical Multiple Regression Analyses Predicting Achievement Negative Interpretation Generation from Cognitive Organization, Type of Prime, and Cognitive Organization by Prime Interaction*

Predictor	(df)F	R	(df) $\Delta R^2$	$\Delta F$	B	SE of B	$\beta$	t
<b>Predictor: Interpersonal Cognitive Organization</b>								
Step 1:	(3, 137) 1.22	.16	(3, 137) .03	1.22				
Negative Interpersonal ISD					0.24	0.18	0.12	1.35
Positive Interpersonal ISD					0.05	0.37	0.01	0.14
Prime Type					0.24	0.16	0.13	1.52
Step 2:	(5, 135) 1.37	.22	(2, 135) .02	1.59				
Negative Interpersonal ISD X Prime					-0.57	0.35	-0.54	-1.62
Positive Interpersonal ISD X Prime					-0.78	0.76	-0.37	-1.03
					$R = .22; R^2 = .05; R_{adj.}^2 = .01$			
<b>Predictor: Achievement Cognitive Organization</b>								
Step 1:	(3, 132) 0.99	.15	(3, 132) .02	0.99				
Negative Achievement ISD					-0.14	0.17	-0.07	-0.81
Positive Achievement ISD					-0.06	0.23	-0.02	-0.27
Prime Type					0.25	0.17	0.13	1.56
Step 2:	(5, 130) 0.84	.18	(2, 130) .01	0.64				
Negative Achievement ISD X Prime					-0.36	0.37	-0.43	-1.01
Positive Achievement ISD X Prime					-0.36	0.47	-0.23	-0.76
					$R = .18; R^2 = .03; R_{adj.}^2 = -.01$			

*Note.* ISD = Inter-Stimulus Distance, as measured by the PDST. Recall that lower ISD scores indicate tighter interconnectivity among elements.

## Appendix J

## Ethics Board Approval Letter



Research Ethics

**Western University Non-Medical Research Ethics Board  
NMREB Full Board Initial Approval Notice**

**Principal Investigator:** Prof. David Dozois  
**Department & Institution:** Social Science/Psychology, Western University

**NMREB File Number:** 108427  
**Study Title:** The Effects of Thinking on Mood and Mood on Thinking

**NMREB Initial Approval Date:** October 17, 2016  
**NMREB Expiry Date:** October 17, 2017

**Documents Approved and/or Received for Information:**

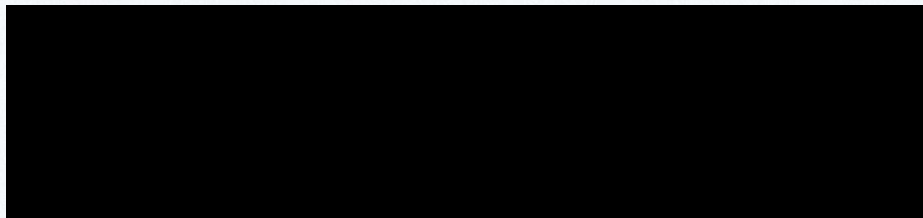
Document Name	Comments	Version Date
Western University Protocol	Received October 17, 2016	
Recruitment Items	Classroom Ad	2016/09/19
Recruitment Items	Facebook Ad	2016/09/19
Recruitment Items	Recruitment Poster	2016/09/19
Recruitment Items	SONA Ad	2016/09/19
Recruitment Items	Recruitment Email To Reply	2016/08/22
Recruitment Items	Email Script for Previous Participants	2016/08/22
Letter of Information & Consent	Paid Participants	2016/09/19
Letter of Information & Consent	SONA participants	2016/09/19
Instruments	Self-Referent Encoding Task Word List	2016/08/22
Instruments	Psychological Distance Scaling Task Word List	2016/08/22
Instruments	Prime Procedure Feedback Questionnaire	2016/08/22
Instruments	Visual Analogue Scale	2016/08/22
Instruments	Beck Depression Inventory - Received August 26, 2016	
Instruments	Interpretation Bias Questionnaire - Received August 26, 2016	
Instruments	Cognitive Distortions Scale - Received August 26, 2016	
Instruments	Dysfunctional Attitudes Scale - Form A - Received August 26, 2016	
Instruments	Young Schema Questionnaire - Received August 26, 2016	
Instruments	Depression and Anxiety Stress Scale - Received August 26, 2016	
Instruments	Demographics Questionnaire - Received August 26, 2016	
Instruments	Prevention Trial Survey - Received August 26, 2016	
Other	Debriefing Form	2016/09/19
Other	Consent for Contact for Future Studies	2016/09/19

The Western University Non-Medical Research Ethics Board (NMREB) has reviewed and approved the above named study, as of the NMREB Initial Approval Date noted above.

NMREB approval for this study remains valid until the NMREB Expiry Date noted above, conditional to timely submission and acceptance of NMREB Continuing Ethics Review.

The Western University NMREB operates in compliance with the Tri-Council Policy Statement Ethical Conduct for Research Involving Humans (TCPS2), the Ontario Personal Health Information Protection Act (PHIPA, 2004), and the applicable laws and regulations of Ontario.

Members of the NMREB who are named as Investigators in research studies do not participate in discussions related to, nor vote on such studies when they are presented to the REB.



*Curriculum Vitae*  
**Lindsay K. Szota**

**Education**

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**Master of Science, Clinical Psychology** Anticipated Completion: September 2017  
The University of Western Ontario, London, Ontario, Canada  
*Advisor:* David J. A. Dozois, Ph.D.

**Bachelor of Science, Honours Specialization in Psychology** April 2014  
The University of Western Ontario, London, Ontario, Canada  
*Advisor:* David J. A. Dozois, Ph.D.

*Undergraduate Thesis:* Cognitive and Interpersonal Vulnerabilities for Depression: The Mediating Role of Rumination and Excessive Reassurance Seeking on the Relations between Early Maladaptive Schemas and Depression.

**Awards and Honours**

- 
- |                                                                                          |            |
|------------------------------------------------------------------------------------------|------------|
| • Ontario Graduate Scholarship (\$15, 000)                                               | 2016-2017  |
| • Western Graduate Research Scholarship (\$12, 201)                                      | 2016-2017  |
| • SSHRC Canadian Graduate Scholarship-Master's (\$17, 500)                               | 2015-2016  |
| • Western Graduate Research Scholarship (\$12, 600)                                      | 2015-2016  |
| • Ontario Graduate Scholarship (\$15, 000; deferred)                                     | 2015-2016  |
| • Dean's Honour List                                                                     | 2010- 2014 |
| • The W. J. McLelland Award (Outstanding Honours Thesis; \$550)                          | 2014       |
| • CPA Certificate of Academic Excellence                                                 | 2014       |
| • National Science and Engineering Research Council (NSERC) Summer Scholarship (\$4,500) | 2013       |
| • The Western Scholarship of Distinction (\$1,500)                                       | 2009       |

**Refereed Book Chapters:**

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Dozois, D. J. A., & **Szota, L.** (in press). Theoretical Perspectives on Abnormal Behaviour. In D. J. A. Dozois (Eds.) *Abnormal Psychology*. Elsevier, NY.

**Conference Presentations**

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**Szota, L.**, Dozois, J. A., & Goldberg, R. (November, 2017). *Cognitive organization and depression: The mediating role of interpretation biases*. Poster accepted to be presented at the 2017 meeting of the Association of Behavioral and Cognitive Therapies, Hilton San Diego, San Diego, CA.

**Szota, L.**, Wilde, J. L., Gillies, J. C. P, Dozois, D. J. A. & Hayden, E. P. (June, 2017). *Maternal transmission of cognitive vulnerability to depression*. Poster presented at the 2017 meeting of the Canadian Psychological Association, Fairmont Royal York Conference Centre, Toronto, ON.

- Goldberg, R., **Szota, L.**, & Dozois, D. J. A. (June, 2017). *The effects of cognitive organization and mood priming on information processing*. Poster presented at the 2017 meeting of the Canadian Psychological Association, Fairmont Royal York Conference Centre, Toronto, ON.
- Wilde, J. L., Gillies, J. C. P., **Szota, L.**, Dozois, D. J. A. & Martin, R. A. (June, 2017). *The role of emotional intelligence and self-criticism in depressive symptoms*. Poster presented at the 2017 meeting of the Canadian Psychological Association, Fairmont Royal York Conference Centre, Toronto, ON.
- Gillies, J. C. P., **Szota, L.**, Wilde, J. L., Dozois, D. J. A. & Martin, R. A. (June, 2017). *Examining the structure of the young schema questionnaire-short form in a non-psychiatric undergraduate sample*. Poster presented at the 2017 meeting of the Canadian Psychological Association, Fairmont Royal York Conference Centre, Toronto, ON.
- Szota, L.**, Good, A., & Ossenkopp, P. (2014, November). *Toxin-induced gustatory conditioning in rats: Examining the influence of a bitter taste on ingestion of a palatable sucrose solution containing low-level toxin (LiCl)*. Poster presented at the Society for Neuroscience Annual Convention, Washington, DC.
- Rnic, K., Dozois, D. J. A., & **Szota, L.** (2014, July). *Avoidance, excessive reassurance seeking and rumination mediate the relation between cognitive organization of social schemas and depression*. Paper presented at the International Congress of Applied Psychology, Paris, France.
- Rnic, K., Dozois, D. J. A. & **Szota, L.** (2014, June). *Avoidance and rumination mediate the relation between early maladaptive schemas and depression*. Poster presented at the annual meeting of the Canadian Psychological Association, Vancouver, Canada.
- Szota, L.**, Rnic, K., & Dozois, D. J. A. (2014, June). *Early maladaptive schemas and depression: The mediating role of rumination and reassurance seeking*. Poster presented at the annual meeting of the Canadian Psychological Association, Vancouver, Canada.

### **Other Scholarly Activities**

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- Wilde, J. L., & **Szota, L.** (February, 2017). *Bipolar Disorder: Basics & Beyond*. Community lecture to be presented at the London Public Library as a member of Advocacy through Action, London, ON.
- Szota, L.**, & Wilde, J. L. (February, 2016). *Dodging Depression: Early Detection and Prevention*. Community lecture presented at the London Public Library as a member of Advocacy through Action, London, ON.
- McCabe, R.E., Milosevic, I., Rowa, K., Shnaider, P., Key, B., Antony, M.M. & the DART Working Group (**including Szota, L.**). (2016). *Diagnostic Assessment Research Tool (DART)*. Unpublished measure.

Ad Hoc Reviewer, *Europe's Journal of Psychology* (2016)

Ad Hoc Reviewer, *International Journal of Cognitive Therapy* (2016)

Ad Hoc Reviewer, *Journal of Anxiety Disorders* (2015)

### **Research Experience**

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Research Assistant, Anxiety Treatment and Research Clinic, St. Joseph's Healthcare Hamilton (2014-2015)

- Supervisor: Randi McCabe, Ph.D.
- Coordinator of research study examining the efficacy of physical activity in the treatment of OCD
- Clinical note-taker for weekly group CBT for OCD and CBT for GAD
- Conducted exposure exercises with an individual client on a weekly basis
- Administered the *Structured Clinical Interview for DSM-IV Axis I Disorders*
- Observed weekly individual CBT for Panic Disorder
- Gained familiarity with *ResearchNet* coordinating grant application

Research Assistant, The Mood Lab, The University of Western Ontario (2013- 2014)

- Supervisor: David J. A. Dozois, Ph.D.
- Administered online psychological assessments, including the Beck Depression Inventory- II
- Attended workshop on the *Life Events and Difficulties Schedule* and scored participant interview vignettes
- Exercised strong organizational skills when scheduling research participants, updating call logs, and completing data entry

Summer Research Student, Behavioural and Cognitive Neuroscience Laboratory, The University of Western Ontario (2013)

- Supervisor: Peter Ossenkopp, Ph.D.
- Conducted independent research project examining the influence of Quinine and LiCl on consumption patterns in rats
- Gained familiarity with database and statistical analysis software including SPSS and Excel
- Developed strong written communication skills a composing scientific research article

### **Clinical Experience**

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Initial Intervention/Assessment Practicum, The Anxiety Treatment and Research Clinic, St. Joseph's Healthcare Hamilton (May 2016-present)

- Supervisors: Karen Rowa, Ph. D., and Brenda Key, Ph.D.
- Co-lead adult CBT for Social Anxiety group, and adult CBT for GAD group
- Provide individual CBT for health anxiety and vomit phobia
- Conduct diagnostic interviews to establish DSM-5 mood and anxiety disorder diagnoses



Assessment Practicum, Department of Neuropsychology, London Health Sciences Centre, London (January 2017- April 2017)

- Supervisor: Gloria Grace, Ph. D.
- Administered and scored Wechsler Adult Intelligence Scale- Fourth Edition

Assessment Practicum, LaRose Psychology Private Practice, London (January 2017-April 2017)

- Supervisor: Louise LaRose, Ph. D.
- Administered and scored Wechsler Intelligence Scale- Fifth Edition

Summer Student, The Student Development Centre, The University of Western Ontario, London (Summer 2016)

- Supervisor: Kathy Dance, Ph. D.
- Conducted semi-structured interview assessments for incoming clients
- Provided co-therapy for individuals working to improve interpersonal conflict and emotion regulation
- Gained extensive experience with clinical report writing

Wait List Clinic Student Volunteer, Canadian Mental Health Association, London-Middlesex (2012)

- Supervisor: Felicia Otchet, Ph. D.
- With the guidance of a clinical psychologist, reviewed cases and assessed clients with various mental health issues
- Consulted with several mental health professionals to develop treatment plans and counselling strategies for clients
- Obtained experience and invaluable feedback on how to conduct a clinical interview in a mock setting

### **Teaching Experience**

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Teaching Assistant, The University of Western Ontario, London 2016

- Conducted weekly tutorials for undergraduate Adult Abnormal Psychology course
- Marked student written assignments

### **Supervising Experience**

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Assistant Thesis Supervisor, The University of Western Ontario, London Fall 2016-present

- Provide feedback and guidance on an Honour's thesis project on a weekly basis
- Review and edit written portions of the project

### **Professional Organizations**

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London Regional Psychological Association October 2015- present